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> "It will flourish, if naturalists, chemists, antiquaries, philologers, and men of science in different parts of *Asia*, will commit their observations to writing, and send them to the Asiatic Society at Calcutta. It will languish, if such communications shall be long intermitted; and it will die away, if they shall entirely cease." SIR WM. JONES.

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With Plates I & II.

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i. *Topography of the Arabian Sea in the Neighbourhood of the Laccadives.*

SECTIONS AND TEMPERATURES.

Only in recent years has any exploration been made of the bottom of the ocean in Indian Seas, beyond the hundred-fathom line.

Before 1881, the hundred-fathom line, on the West Coast of Hindustan, was well sounded out by the officers of the Indian Navy, but no attempt had been made to define its limits in either the Bay of Bengal or Gulf of Martaban. Since 1881, the officers of the R. I. M. S. "Investigator" have yearly been employed, during the fine season, in surveying the coasts, sounding out to deep water, and taking-deep sea soundings and temperatures when making passages to and from the surveying ground. From the soundings and temperatures obtained in the Bay of Bengal, Commander A. Carpenter, in 1887, was enabled to write a paper on "The Mean Temperature of the Deep Waters of the Bay of Bengal."* Since then, owing to the survey of the Laccadives and the frequent passage of the "Investigator" past this group, a large number of deep soundings and temperatures have been accumulated in the Laccadive area. Advantage is now taken of these soundings to draw a chart shewing the contours in this region (see Plate I).

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* Communicated by the Natural History Secretary.

In the latitude of Bombay the hundred-fathom line is distant about one hundred and twenty miles, the soundings deepen seaward from the coast gradually, forming a shelf, which narrows on proceeding southward, until in the latitude of Cape Comorin it is only thirty miles broad.

The general slope seaward, beyond the hundred-fathom line, is from two to three degrees: it is broken occasionally by ridges or spurs of comparatively shoal water, and in latitude 11° N. a ridge, on which are situated the Elicalpeni Reef and Androth Island, projects for fifty miles to the south-west. In the Laccadive area the eleven hundred fathom line encircles the whole group, connecting the reefs at this depth with the neighbouring slope from the coast of Hindustan. Two tongues of deeper water narrow the connection with the slope from the coast, and an extensive tract of depths over eleven hundred fathoms occupies a position east of the Laccadives, on a line between the tongues.

The western islands and reefs are all situated on an extensive plateau of under a thousand fathoms, and are separated from the eastern by a narrow flat, averaging a thousand and twenty fathoms. The most northern of the group is a submerged reef, situated on the eastern side of a plateau of under nine hundred fathoms; the next two are also submerged reefs, rising from a similar plateau; south of these are three lagoon reefs, likewise connected by depths under nine hundred fathoms; and still further south are two groups each containing two reefs, and three isolated reefs, all rising from similar depths. The eastern reefs consist of three, namely, the two northern, situated on the ridge already mentioned as jutting out from the coast slope, and another island rising abruptly from depths of eleven hundred fathoms.

Minikoi, in lattitude 8° 15° N., sometimes spoken of as being one of the Laccadives, is separated from that group by depths of over twelve hundred fathoms, but has a submarine connection with the *Maldives* to the southward.

The outer slope from the plateau on which the islands are mostly situated is gradual, until the floor of the ocean is reached in depths a little over two thousand fathoms.

Soundings and temperatures obtained during the months of October although in different years—the thermometers used being the Miller-Casella pattern, constructed by Cavy of London; and the observations being corrected for the errors supplied from Kew Observatory—shew that the waters of the eastern part of the Laccadives, in depths over six hundred fathoms, are considerably warmer than the waters towards the Hindustan coast, and than those to the westward of the Laccadives.

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* J. A. S. B., Vol. LVI., Pt. II., 1887, pp. 230-232.

On the plateau a temperature of 41° F. is reached at a depth of 905 fathoms, while the same temperature is met with at 790 fathoms on the thousand fathom line near the coast.

The bottom temperatures on the western side appear somewhat erratic, but with one exception they all tend to shew a higher temperature over the plateau than on either side. The surface temperatures vary from 77° F. to 83° F., the highest temperature being in the neighbourhood of the reefs.

The isothermal lines vary in depth to 400 fathoms, after which they are even to 600 fathoms, from 700 until the bottom is reached they dip downward in the centre owing to the warmer waters over the Laccadives.

A curve shewing the mean temperature at different depths from the surface to 1,300 fathoms, is shewn in black at Plate II. From the surface to 100 fathoms the curve depends on one series of observations taken every 25 fathoms; from 100 to 400 fathoms, it depends on twelve observations at varying depths, and from 400 to 1,300 fathoms, the curve is the mean result of fifty-six observations: all these observations were taken in the months of October, November, or April, at the change of the monsoons. The curve shewn in red on the same figure is taken from Commander Carpenter's paper on the mean temperature of the deep waters of the Bay of Bengal. It is derived from observations taken during the fine season—November to May.

The Arabian Sea curve to 100 fathoms depends on so few observations that it is not desirable, up to this depth, to make any comparison with the Bay of Bengal curve. Beyond 100 fathoms, where the observations are numerous, it will be noted that there is a difference of about one to two degrees; the Arabian Sea on the west coast of Hindustan in October, November, and April, being that amount warmer than the Bay of Bengal. At a depth of 1,300 fathoms the two curves coincide.

Sections of some of the Laccadive islands and reefs—the direction of the sections taken being generally at right angles to the length of the islands—show that the under-water slopes vary from 10 to 27 degrees, and that the slopes of the lagoon islands are rather steeper than that of reefs, at *Betra Par* and *Peremul Par.* At *Kardamat* the bottom slopes 19 degrees each side: *Kiltan* has a slope of 23 degrees on the west side and 27 to 10 degrees on the east: *Chitlac* has the steepest slope on the east side, namely, 27 to 10 degrees, and 13 degrees on the west.

The sections of *Kavaratti* and *Agatti* are very similar, they have both a slope of 13 degrees on their west sides, and a more gradual declivity on the east sides.

In *Peremul Par* and *Betra Par*, which are lagoon reefs, the slopes vary from 14 to 16 degrees in the former, and 10 to 20 degrees in the latter.

From the above it will be seen that the narrowest atolls, *viz.*, *Kardamat*, *Kiltan*, and *Chitlac* have the steepest slopes.

The under-water slopes beyond the two-hundred-fathom line would appear to depend principally on the shape of the peak on which the atolls are situated.

ii. *The Physical Features of some of the Laccadive Islands, with Suggestions as to their Mode of Formation.*

The Laccadives (see Plate I), a group of coral atolls and reefs, lying from one hundred and twenty to two hundred miles from the West Coast of Hindustan, extend from Latitude 10°. N. to 14° N., and Longitude 71° 30′ E to 74° E.

This area contains four submerged coral reefs, six coral reefs with sand cays, or small uninhabited islets, and eight inhabited atolls. Five of the atolls and three of the reefs were examined during the visits of the "Investigator" in October and November 1892-93-94; and are described in the following notes:—

Kiltán Island is two miles long N. N.-W., and S. S.-E., and a quarter of a mile broad, having a shallow lagoon on its side. The highest part of the island, which is about 25 feet above high water-mark, lies on the eastern side: from here there is a general slope downwards to the lagoon, its north and south extremes curving slightly to the westward. In places, ridges of coral and coral-sand stretch along in the direction of its length, breaking the general slope lagoonwards.

The island is formed of coral sand, coral sand rock, and broken fragments of coral reef rock, overlying a hard conglomerate composed of fragments of reef corals. The coral-sand rock may be seen exposed on the lagoon beach of most of the Laccadive islands; it is of a friable nature, but its surface becomes very hard when exposed to the air. Most of the houses are built of blocks of this stone, which are cemented together with *chunam*. Good water is obtained by sinking wells until the conglomerate reef rock is reached.

On the eastern shore the beach is composed of broken boulders of reef corals and comminuted fragments. On this side the reef extends a hundred yards from the beach, and then goes off into deep water; the reef does not dry, and a boat in fine weather can always pass over it and ground on the beach off the ends of the island; shallow water of 5 to 7 fathoms extends over half-a-mile. The lagoon appears to be 6 to 8 feet deep, and has two openings to it through the reef. These openings would soon close by the growth of the coral did not the natives periodically clear the passages.

The island appears to be extending lagoonwards, by the accumulation of coral sand washed from the reef; its extremes are also being added to by the sand and *débris* washed up by the currents. Its surface is thickly planted with coconuts, jungle being found only on the extremities and where the island has extended lagoonwards.

Mention has already been made of the reef on the eastern side of the island; that on the western side is different in character, being a reef a-wash at low water, which extending from the extremes of the island, encloses the shallow lagoon. Owing to the weather no examination was possible, but viewed from seaward it appeared to be formed of coral in vigorous growth: the soundings obtained shewed a gradually increasing depth from the reef to the 20-fathom line, where it drops into deep water.

Chitlac Island extends N. N.-E. and S. S-W. 1¾ miles, and is about one-third of a mile broad. Like Kiltán it forms the eastern side of a coral atoll. Ridges and mounds of sand and coral were observed in different parts, the highest mound being about 30 feet above high water. On the eastern side, inside the beach, is a long narrow depression. The eastern beach is covered with big boulders of reef corals. The fringe reef extends 20 to 30 yards from the beach, uncovers at low water, and has growing coral at its edge; its surface being strewn with coral *débris*.

The north point of the island extends about 200 yards beyond the coconut plantation, and curves towards the lagoon; the first 100 yards of this extension is covered with littoral plants, the last part with large boulders of coral broken off the fringe-reef, which here is very narrow. Sand has been washed up and has accumulated amongst the boulders.

The north point of the island has altered in appearance since the last survey in 1848. At that time, an island existed off the north end, which at present is connected to the main, and covered with bushes. The natives report that the connection was made in November, 1891, during a storm from the N.-E.

The reef enclosing the lagoon has two openings through it, that to the northward being broad and shallow with numerous patches of growing coral. An examination with a water-glass shewed that, off the eastern and southern sides, coral was growing in 5 to 7 fathoms, and everywhere off the western side of the atoll it appeared to be growing luxuriantly. An attempt was made to collect some, but owing to defective means none was obtained; the grapnel sent down, after catching several times and bringing nothing up, eventually caught a large mass of madrepore, and was lost.

Inside the lagoon, and in the northern entrance, numerous patches of *Porites*, Madrepore, and blue coral were growing, except towards the south end where the bottom is principally coral sand. The absence of live coral towards the south end is no doubt due to the reef here being almost continuous, preventing the current and tides from supplying food, and the coral being killed by the accumulation of sand washed from the reef. In all parts where the tide ebbed and flowed live coral was observed.

Good water is obtainable on the island, and as in Kiltán, is no doubt the drainage from the soil resting on the conglomerate coral rock.

I found several pieces of volcanic rock, and a green stone on the north end of the island; they were said by the natives to have been brought from Byramgore Reef, where a steamer with stone ballast had been wrecked.

Kardamat Island extends 4½ miles N. N.-E. and S. S.-W., with an average width of about a quarter of a mile. Like Kiltán and Chitlac it is situated on the eastern side of an atoll, and forms about one-third the circumference. The centre of the island, and oldest part, is well covered with coconuts. It seems to be formed principally of blown sand overlying coral-sand rock. The latter can be observed in many places on the lagoon edge; where it is exposed between high and low water, it generally dips at a slight angle towards the lagoon.

The extremes of the island carry a scanty vegetation of jungle 6 to 8 feet high, but attempts are being made to grow coconuts over the whole island.

The northern point of the island is formed by a spit of sand on which I found a quantity of pumice, extending inland for about fifty yards from the extreme point; it is strewn all over the surface, and varies in size from a marble to half a foot in diameter.

Although there is a large quantity on the point, it is not more than is frequently found washed up on coral islands in other parts of the world, where, as is the case at Kardamat, the currents are favourable for collecting and washing up whatever may be floating in the neighbouring seas.

This pumice was first noticed by the surveying officers during their visit in the autumn of 1892, and is mentioned by Dr. Alcock in in his Administration Report for that year.

The south extreme of the island is a sandy point along which vegetation is gradually creeping as the point extends.

The fringe-reef which fronts the eastern edge of the island is narrow, and has growing coral on its edge, only the surface of the reef being encrusted with Nullipore, or cemented into a reef flat.

The remaining part of the atoll, not occupied by the island, is a coral reef, awash at low water, the only openings being to the N.-E., and very narrow. In consequence, there is very little live coral within the lagoon, the most notable patches being in the neighbourhood of the entrance and towards the western side, opposite the centre of the island. The lagoon is from 2 to 6 feet deep.

The soundings shew that the bottom slopes steeply on both the east and west sides of the atoll, from about 20 fathoms into deep water, but towards the N. N.-E. and S. S.-W., the direction in which the atoll soundings shew a much more moderate slope, there is a depth of 272 fathoms at two-and-a-half miles from the north point, compared to 500 fathoms at one-and-a-quarter mile from the east side, and 730 fathoms at one-and-three-quarter mile from the west side of the atoll.

Betra Par. This is an atoll six miles north and south, and three miles broad, with an islet on its north-east end, and two sand cays joined by patches of sand, on its eastern side. The islet is nothing but a sand cay, covered with coconuts, extending nearly half-a-mile along the reef. Its inner side, which is washed by the waters of the lagoon, is probably the oldest part, as it carries the tallest coconuts; here the sea is encroaching, the roots of the trees are exposed, and several have fallen. The north-east side of the islet is formed by a shallow bay in which are several slabs of coral-sand rock, which jutting out beyond the line of the beach shew that that part of the beach has been washed away. The extremities of the island are increasing in the direction of its greatest length.

The encircling reef dries nearly everywhere at its edge at low water springs; it is broadest on the eastern and southern sides, and has only one opening through it, just south of the islet.

I examined the northern and western sides of the reef, and the other surveying officers visited the other portions. The middle of the western side is about 250 yards broad, and on the extreme western part is an iron band boiler which must have been part of a wreck; it is embedded about one foot and lies completely on the reef, so that at low water I was able to walk round it. Two clumps of coral about one foot in diameter were growing on its outside, and several smaller inside.

The reef here dries about one foot at low water and is covered with live coral. Of the latter the branching Madrepores were the most common, but a *Porites* and Brain-coral were also numerous.

The north side of the reef is the narrowest; it dries 3 feet at low water, is about 100 yards broad, and is composed of piled up coral, broken off the growing edge.

Inside the lagoon the average depth is from 3 to 4 fathoms. Here are numerous coral clumps awash or dry at low water. I examined two of them and found that coral was growing on the sides, but the top was dead, and covered with Nullipore.

Inside the reef, from the islet round the western side to the sand cays on the south side, is a remarkable broad shelf with about half a fathom water over it, formed of dead coral and sand, the coral being in a state of decomposition.

This shelf is about half a mile broad on the north-west part, increasing as the width of the growing reef increases, and reaching a width of one mile to the southward. On its inner side it drops suddenly into the general depths of the lagoon which I have already mentioned as being from 3 to 4 fathoms.

I think that this shelf may be accounted for on the supposition that the coral reef commenced to grow at the inner edge of the shelf, and has worked seaward, leaving behind it a reef-flat, which is kept at its present level by sand and *debris* being washed in from the outer edge, and by the solvent action of the sea-water. The eastern side of the atoll, not being so favourably situated as regards the currents and tides, has not grown seaward sufficiently and rapidly to leave a reef-flat behind; it is here also that sand and *debris* collect which would also assist in retarding the growth of the coral.

The soundings shew a fairly corresponding slope on all sides, from the edge of the reef out into deep water.

Peri Mul Par. This reef, which only dries at low-water springs, is somewhat crescent shaped, the concave side being open to the northwest. Its longest diameter is seven miles, and its width four miles. The edge of the reef shews at low water, but at high water and in smooth weather it is difficult to distinguish, and in many places does not break. The encircling reef is very narrow, and I am informed by the officers who examined it that it is only growing at the outer edge.

Inside the reef, and extending towards the centre for about one mile, all round the south west and north sides, is a shallow flat or shelf with depths over it of under one fathom. It consists of sand and broken coral, and seems, as in Betra Par, to be formed by the seaward growth of the reef and the dissolving action of the sea-water. Inside this reef-flat the depths are from 3 to 6 fathoms, the centre part containing ridges of coral which run N. N.-W. and S. S.-E.; towards the N.-E. side there are fewer coral-heads, and here are several good boat entrances.

At the N.-E. corner of the atoll is a small sand cay with coral boulders piled up on its eastern side. Patches of sand, which shew at low water, are also found on the eastern side of the atoll.

From the appearance of the reef, the reef-flat, and the soundings, it is evident that the reef is growing westward and southward at a greater rate than in other directions.

Kavaratti. Like the other eastern atolls of the group, consists of an island, with a coral reef on its western side enclosing a shallow lagoon. The island is 2¾ miles long N.-E. and S.-E., and three-quarters of a mile broad towards its north end, narrowing to about a cable half a mile from its south extreme. The coral reef forming the lagoon runs parallel to and is about six cables from, the beach, it is awash at high water near the north end, but covers nearly half a fathom about the centre.

On the lagoon side the island has sand hillocks 15 to 20 feet high, lining the beach for about half the length of the island from the N.-W. extreme; in the centre of the island is a fairly level area, the land sloping up gently as the eastern beach is approached.

The beach on the N.-E. side is strewn with large coral boulders; the eastern beach is exceedingly steep, with a narrow fringe reef. The natives of this island seemed better off than in most of the Laccadive islands; they own several large boats which trade with Cochin.

A comparatively wealthy and intelligent native who had lived here all his life was questioned as to changes that had occurred in the configuration of the island. According to him the most frequent gales are from the south west, when large quantities of sand are blown up and deposited on the western side of the island, only to be washed away by the currents and winds of the other season. Good water is obtained from wells about 10 to 12 feet deep, formed by cutting through a thin stratum of coral rock below which the fresh water seems to lodge.

Agatti (Aucutta) group, comprises two atolls situated N.-E. and S.-W. of each other towards the extremes of an extensive plateau carrying from 5 to 10 fathoms on it, which inside the 100 fathom line extends from 15 miles and forms a slight curve, the convex side to the N.-W.

The southern atoll has the island of Agatti situated on its eastern side; a broken coral reef forming a shallow lagoon extends in two arms, like claws, from its north and south extremes, leaving a good entrance for boats between. The island is four miles long by half a mile broad, its greatest breadth, as in Kavaratti, being towards its north end, narrowing to a point to the southward; a narrow shallow channel separates the south point from the small island of Kalputhi. On the western and southern side of the island a long line of coral-sand rock is exposed on the beach, as though the preceding south-west monsoon wind had removed the loose sand in the neighbourhood; also towards the south end a line of it is visible in the lagoon thirty feet from the shore, while on both sides of the sandy spit forming the south point broken and dead branches of the bushes lie on the spit. Towards the north and north-west, where the island has its greatest breadth, the lagoon beach is being added to, and coconut trees are being planted: in fact, the whole of the north end is very level, and leads to the idea that it has been comparatively recently formed by the deposition of sand from the reef and southern part of the island. The eastern side is steep too, with a narrow fringe-reef. Kalputhi is situated to the south of Agatti and is formed of coral rock and sand; its northern point extends in a, sandy spit towards Agatti.

The northern atoll extends five miles east and west, and has an average width of two-and-a-half miles. The coral-reef enclosing the lagoon is somewhat rectangular in shape, and is continuous, except on the western side, where there is a broad shallow entrance; in the centre is the island of Bungarra, and two other islands and some islets are situated towards the eastern side of the atoll; they are all very low and level, and no fresh water is obtainable; as at Betra, they appear to be merely sand-cays covered with vegetation. Bungarra, the centre islet, shewed signs of being washed away on its north and west sides, the coconuts on these sides having fallen and lay rotting on the beaches. The central portion of the lagoon is full of coral heads, with 2 to 4 fathoms of water between, but all round the inside of the reef is a level flat, similar to the flat at Betra and Peremul Par; it has an average width of one-third of a mile, except on the south side, where it attains a width of about three-quarters of a mile. Flood tide was found to set S. S.-E., ebb N. N.-W.

Off the western side of Bungarra, and extending out towards the entrance, are two long sandy arms which curve round towards each other and dry; they are probably formed by the deposition of the sand during ebb, as follows—as soon as the level of the lagoon during ebb has fallen to the level of the encircling coral reef, the remaining waters have to escape by the channel on the western side; the current then is strong, and the island lying in the track, it rushes past with considerable velocity; the waters of the lagoon are filled with sand carried in during flood, and the eddy currents deposit this sand on the western side of the island, forming the two spits. From the soundings and the appearance of reef and reef-flat it seems probable that the reef is extending southward more rapidly than in other directions.

Suheli Par, of an oval-shape, extends nearly nine-and-a-half miles N. N.-E., and S. S.-W., with a width of about three-and-a-half miles. A very narrow fringe reef, broken to the N.-W., encloses a lagoon with depths of 4 to 7 fathoms in it. The S. and S.-E., sides of the atoll are occupied by a shallow sandy flat similar to the flats in Betra, Peremul, and Bungarra reefs. The reef flat extends along the east side to the north extreme, but is much narrower here than on the S. and S.-E. sides.

Two islands are situated on the reef-flat, one on the extreme north point, and the other three-quarters of a mile from the edge of the reef on the south-east side of the atoll. They are both very low and level; and like the islands at Betra and Bungarra are sand-cays, covered with vegetation. The northern of the two has in several places the sand of which it is formed cemented into coral-sand rock, which shews plainly on the eastern side, and there is still in process of formation. On the western side this rock has been broken up by the south-westerly gales, and is strewn over the beach just above high-water mark; the northern and southern extremes are formed by sand spits which appear to be extending. The south island I had no opportunity of examining, but the plan of it shews that it has two arms or spits of sand extending from the extremes to the northward, in the direction taken by the ebb current. No good water exists on either island. In addition to the islands, a sandy spit and patches of sand, which dry, extend for more than a mile along the N.-E. side of the atoll.

A shallow flat with 4 to 5 fathoms on it extends off the north end for about a mile, otherwise the hundred-fathom line lies about 2 cables from the reef. From the existence of the reef flat the atoll appears to be extending most rapidly to the south and south-east sides. The islands are apparently formed first as sand cays.

Peculiar characteristics to be noted from the foregoing observations.

1. Kiltan, Chitlac, Kardamat, Kavaratti and Agatti are all situated on the eastern side of the atolls; at Betra Par there is an islet and two

sand-cays, at Peremul Par a sand cay and patches of sand, at the northern atoll Agatti, some small islets, and at Suheli Par two islets and some sand-cays; these again are all formed on the eastern side of the reefs, with the exception of the island of Bungarra in the north atoll of the Agatti group.

2. At Kiltán, Chitlac, Kardamat, Kavaratti and Agatti, the shallow depths where live coral exists, and the flourishing condition of the edges of the coral reefs on the western and southern sides, also the extensive shelf of reef-flat inside the outer reefs at Betra Par, Peremul Par, and the northern atoll Agatti, shew that the atolls are all extending westward, southward, and in the case of Suheli Par south and south-eastward more rapidly than in other directions.

3. The islands and islets are extending at their extremities, and in some cases are being added to on the lagoon side.

4. The larger the atoll the deeper the lagoon.

5. No signs of elevation or subsidence were observed. The islet at Betra Par, although being washed away on its N.-E. and S.-W. sides, is extending at its extremities.

6. Large boulders of coral rock are found on the beach, on the east and north east sides of the islands.

7. With one exception, that of Peremul Par, the entrances to the lagoon are on the north-east, north, and north west sides: that is, to windward.

A careful study of the strong winds found in the neighbourhood of the Laccadives establishes the fact that the strongest of the ordinary monsoon winds is from west, this sometimes has a force of 4 to 5; also the vast majority of winds are from some point between N. N.-E. round to S.-W. It is evident that these winds and the seas caused by them, could not have piled up large boulders and blocks of coral on the E. and N.-E. lee sides sufficient to form the foundations of the present islands; there must have been some other agency at work, and this is probably to be found in the hurricanes of these seas. Hurricanes are rare at the Laccadives, but between these islands and the coast of India and to the south-eastward over the southern end of the Indian Peninsula, hurricanes are comparatively frequent. Their course is to the W. N.-W. or north-westward, passing up between the Laccadives and the Malabar coast. (One of these storms is mentioned in the description of Chitlac). During these storms the winds at the Laccadives would be E., N.-E. (the N.-E. being very strong) N. and then N.-W. At the latter point the wind would be moderating.

The seas due to the hurricanes would strike on the eastern and north-eastern sides of the atolls with tremendous force, smashing and tearing the coral boulders off the edge and hurling them on to the centre of the reef; here then would be the foundation for the future island. The currents and tides and ordinary monsoon winds would then be sufficient to complete the remainder of the building up process. The strong winds of the south-west monsoon would cause sufficient sea to grind portions of the reef to sand, and this would be carried by the currents over and around the atoll to the lee side; here eddy currents, due to the obstruction of the atoll, would occur, depositing sand and debris to assist in raising the reef above high water; seeds would be brought by the sea or deposited by the birds; then man assisting, the once barren reef would develope into the present thickly planted coconut island; each gale occurring would assist in adding to its size, and it may be that the parallel ridges noticed in some of the islands are due to the successive gales.

The cause of the more vigorous outward growth of the reef to the southward and westward, I have little doubt is due to the tides and currents. In these seas the currents vary with the monsoon, being nothing more than drift currents, except where their speed is accelerated by some obstruction, as off the south coast of Ceylon. In the Laccadives, the observations of currents are exceedingly scanty. Those observed during the Investigator's visits appeared to be entirely due to wind.

The Admiralty current-chart, compiled from the greatest number of observations obtainable, shews that the currents are from east and north-east during the north-east monsoon, and from north north-west to south-west during the remainder of the year, this latter period lasting from March until October, or for eight months. The east-going currents are strongest, would carry most food to the coral reefs, and striking first on the western side of the atolls, would give up a portion of the food which they carry; then the sand formed by the breakers would be carried from the weather side and be deposited to westward, tending to retard the coral growth on the eastern side and to assist in forming the present islands and islets.

The tides are not strong in the Laccadives; the flood sets to the north-east past the northen reefs and east and south-east in the neighbourhood of the southern ones, that is, in a course at right angles to the length of the reefs.

The flood would be a food-bearer to the reefs, and therefore the tides would be another agent assisting the outward growth of the reefs to the south-west and westward.

It is difficult to account for the positions of the openings to the lagoons, which are as already stated on the north-east, north or north-west sides of the lagoon.

According to Dana[*] the waves with the rising tide dashing over the windward side of the reef, tends to keep open a leeward channel for the passage of the water. This is evidently not the case in the Laccadives, as the channels are generally on the weather side, but the position varies considerably without any apparent reason.

On a new species of Flying Lizard from Assam.—*By* A. ALCOCK, M.B., C.M.Z.S., *Superintendent of the Indian Museum.*

With Plate III.

[Received 15th October—Read 7th November.]

Draco norvillii, n. sp.

Nostril nearly vertical. Tympanum scaly and hidden. The wing-membranes with three broad scarlet bands: the lateral gular folds scarlet beneath.

Head one-fourteenth to one-fifteenth of the total length. Snout hardly longer than the diameter of the orbit.

Nostrils tubular: pierced at an angle of about 17° from the vertical.

Tympanum scaly and hidden. A scaly knob at the posterior angle of the orbit. Upper head-scales unequal, keeled: nine upper labials.

Gular appendage of the male a little longer than the head, broadly foliaceous, and covered with large thin scales: much resembling that of *D. blanfordii*. Nuchal fold just distinguishable. Dorsal scales small, smooth, unequal; not, or not much, larger than the keeled ventrals. In the lateral series of enlarged scales there are not more than ten on either side, and these are very irregularly disposed, and have, most of them, tag-like keels. The forelimb stretched forward reaches beyond the tip of the snout by almost the length of the hand. The adpressed hind-limb reaches to the axilla.

Colours in spirit on the dorsal aspect: lichenous-mottled; with shades of dull metallic blue predominating on the crown of the head and on the posterior thoracic region; and with shades of dull purplish brown, with well defined black spots, on nape, neck, shoulders, and anterior thoracic region: wing-membranes beautifully reticulated mottled and speckled at base, and traversed by three dull red cross-bands, which are darkest near the edge. Of these cross-bands the most anterior extends from the edge to about the middle of the wing, where it is lost in an indistinct bifurcation : the most posterior extends from the angle of the wing, along its posterior border, right up to the groin, first bifurcating: while the middle one, which also ends in a bifurcation, is in extent, intermediate between the other two.

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[*] *Corals and Coral islands*, James Dana, page 211.

Median gular fold light lemon-yellow; lateral gular folds dull scarlet beneath.

The dull red bands on the wing membranes, and on the under-surface of the gular side-folds are described as scarlet in life.

Total length ...	11·75 in.
Length of tail ...	7·5 ,,
Length of head ...	·8 ,,
Span of wings ...	4·1 ,,
Length of forelimb ...	2·0 ,,
Length of hindlimb ...	2·35 ,,

In accord with Mr. Boulenger's Synopsis of the Genus *Draco* (Catalogue of the Lizards in the British Museum, second edition, 1885, pp. 253–255), this fine species would be placed with *D. quinquefasciatus* in the second section of the genus as follows:—

Section 1. Nostril lateral, directed outwards: 17 species.

Section 2. Nostril pierced vertically, directed upwards:—

- A. Tympanum naked (*D. hæmatopogon*, *D. melanopogon*, *D. blanfordii*, *D. dussumieri*, *D. tæniopterus*, *D. obscurus*).
- B. Tympanum scaly (*D. quinquefasciatus*, *D. norvillii*).

Its place among the *Indian* species of the genus is shown in the following table, modified from Mr. Boulenger's Synopsis in the *Fauna of British India, Reptilia and Amphibia*, p. 112:—

- A. Nostrils lateral : tympanum scaly......................*D. maculatus.*
- B. Nostrils vertical:—
  - 1. Tympanum naked ....*D. blanfordii*, *D. dussumieri*, *D. tæniopterus.*
  - 2. Tympanum scaly and hidden .... *D. norvillii.*

A single specimen was taken by Dr. F. H. Norvill of Doom Dooma, Upper Assam, to whom I have much pleasure in dedicating the species.

Materials for a Flora of the Malayan Peninsula.—*By* George King, M.B., LL.D., F.R.S., C.I.E., *Superintendent of the Royal Botanic Garden, Calcutta.*

No. 7.

In working out the difficult family of *Meliaceæ*, I have had the great advantage of being able to consult a suite of the specimens of Blume and Miquel, which were kindly lent to me, for the purposes of comparison and study, by Drs. Suringar and Boerlage, of the Leiden Herbarium. Many specimens, chiefly of Bornean species, were, through the kindness of its Director, Mr. W. T. Thiselton Dyer, F.R.S., also lent to me from the Kew Herbarium, some of which were enriched by notes by Dr. O. Stapf, a member of the staff of that Institution.

Order XXVII. *Meliaceæ.*

Trees or shrubs. *Leaves* alternate, exstipulate, usually pinnate, rarely simple or bipinnate; leaflets opposite or alternate, usually quite entire and more or less oblique at the base. *Flowers* hermaphrodite or polygamo-diœcious, regular, usually in axillary panicles. *Calyx* 3- 6-lobed, sometimes entire or with free sepals, usually imbricated in bud. *Petals* 3–6, free or rarely connate at the base, sometimes adhering to the lower half of the staminal tube, valvate or imbricated. *Stamens* 3–12, inserted outside the base of the hypogynous disk; filaments connate in a tube or rarely free; anthers erect, usually sessile on the tube, included or exserted, 2-celled, dehiscing longitudinally. *Hypogynous disk* tubular annular or obsolete, free or connate with the ovary. *Ovary* usually free, 2- 5-celled; style single, stigma disciform or capitate; ovules 2, rarely more, collateral or superposed, raphe ventral, micropyle superior. *Fruit* capsular, drupaceous or baccate. *Seeds* exalbuminous or sometimes with fleshy albumen, often enclosed in an aril.—Distrib. About 700 species, mostly tropical.

Key to the Genera.

Stamens united in a tube.
*Cells of ovary with 1 or 2 ovules in each.
Leaflets serrate; fruit drupaceous ... ... 1. Melia.
Leaflets entire; fruit baccate or capsular.
Flowers and staminal tube narrow, elongate; style elongate.
Stigmas 5 or 5-toothed; leaves trifoliolate; fruit baccate ... ... 2. Sandoricum.
Stigmas entire, single; leaves pinnate; fruit capsular or sub-capsular.
Petals in 2 rows; ovary 7- to 9-celled, with 1 ovule in each cell; disk short, inferior to ovary 3. Megaphyllæa.
Petals in a single row; ovary 2-to 4-celled.
Disk short, annular; ovules solitary in the cells of the ovary ... ... 4. Chisocheton.
Disk cylindric, longer than the ovary; ovules 2 in each cell of the ovary ... 5. Dysoxylum.
Flowers and staminal tube globose or turbinate, style short or absent.
Anthers included or incurved.
Petals 3; fruit dehiscent or not ... 6. Amoora.
Petals 5; fruit indehiscent.
Style none ... ... 7. Aglaia.
Style short, thick ... ... 8. Lansium.
Anthers exserted, never incurved, only partially united into a tube (in two species of *Walsura* not united.)
Petals 5; fruit baccate, indehiscent ... 9. Walsura.
Petals 4 or 5; fruit capsular, dehiscent 10. Heynea.
**Cells of ovary 2- to 8-ovuled; stigma discoid; fruit capsular; seeds large, fleshy, not winged ... ... 11. Carapa.
***Cells of ovary with numerous ovules in each; stigma capitate; fruit capsular; seeds thin, winged 12. Chickrassia.
Stamens distinct.
Cells of ovary 8- to 12-ovuled; seeds membranous, winged 13. Cedrela.
Cells of ovary with 1 or 2 ovules, fruit baccate; seeds not winged ... ... 9. Walsura.

1. Melia, Linn.

Trees with pinnate or 2- 3-pinnate leaves, toothed or entire leaflets and panicled axillary flowers; pubescence often stellate-mealy. *Calyx* short, 5-6 lobed, imbricated. *Petals* 5-6, free, spathulate-oblong, patent, imbricated in bud. *Staminal-tube* cylindrical, dilated at base and apex, 10- or 12-striate and -toothed; anthers 10 or 12, included or partly exserted, short, inserted near apex. *Disk* annular. *Ovary* 3- 6-celled; cells alternate to the sepals when equal in number to them. *Style* slender, nearly as long as the tube, stigma capitate; ovules 2, superposed. *Fruit* drupaceous. *Seeds* with thin fleshy albumen; cotyledons foliaceous. Distrib. About 12 species; Indo-Malayan.

Petals concave, obtuse; ripe drupe 1 to 1·5 in. long ... ... 1. *M. composita.*
Petals flat, sub-acute; ripe drupe ·6 to ·7 in. long ... ... 2. *M. Azedarach.*

1. Melia composita, Willd. Sp. Plant. II. 558. A tall tree; young branches rather stout, at first covered with pale loose stellate pubescence, ultimately smooth and of a dark colour. *Leaves* 1 to 2 feet long, bi- or occasionally tri-pinnate, the leaflets on each pinna 5- to 11, petiolulate, from ovate-lanceolate to ovate-rotund, often oblique at the base, acuminate, serrulate or entire; the main nerves 7 or 8 pairs, sub-horizontal, rather distinct on the lower surface; both surfaces sparsely stellate-pubescent when young, ultimately glabrous. *Panicles* shorter than the leaves, pedunculate, spreading, stellate-hairy, many-flowered. *Flowers* ·3 to ·35 in. long. *Calyx lobes* erect, ovate-lanceolate, stellate-tomentose outside, pubescent or glabrous inside, much shorter than the petals. *Petals* linear-spathulate, concave, pubescent externally, puberulous internally. *Staminal tube* nearly as long as the petals, slightly expanded at the 10-toothed mouth; the teeth bifid, silky-puberulous on both surfaces; anthers exserted, pubescent. *Stigma* 5-toothed. *Drupe* ovoid, 1 to 1·5 in. long, smooth, yellowish. *Seeds* one in each cell, smooth, pointed. W. and A. Prod. I. 117. (excl. syn. *M. superba*, Roxb.); Dalz. and Gibs. Fl. Bomb. 36; Thwaites Enum. Pl. Ceyl. 59; Bedd. Fl Sylvat. t. 12; Brandis For. Flora 69. *M. dubia*, Hiern (not of Cav.) in Hook. fil. Fl. Br. Ind. I, 545; De Cand. Monog. Phan. I. 453; Trimen Flora Ceylon Vol. 1. 243 (exc. from all the syn. *M. superba*, Roxb.). *M. robusta*, Roxb. Hort. Beng. 33; Fl. Ind. II, 397. *M. australasica*, Adr. Juss. in Mem. Mus. XIX, 257. *M. æthiopica* and *M. Bombolo*, Welw. Apontam. Phyto-Geogr. Prov. Angola, 584 and 561. *M. argentea*, Herb. Ham. ex Wall. Cat. 1254 C.

Malacca: Maingay No. 317 (Kew Dist.), and probably in some of the other provinces. Distrib. Brit. India, Ceylon, Australia, Angola.

This is a widely-spread species, and has received many names. From the synonymy above quoted, I have excluded *M. superba* Roxb., which I believe to be a distinct species, with which the tree named *M. Birmanica* by Kurz (Journ. As. Soc. Bengal, Vol. 43, pt. 2, p. 183;

For. Flora Burm. I, 213) is probably identical. In Roxburgh's original descriptions of *M. superba* and *M. robusta*, he carefully states the differences on which he depends for their separation. These are as follow:—

M. superba.	*M. robusta.*
Leaves bi- tri-pinnate, 2 to 4 feet long.	*Leaves* bi-pinnate, 12 to 18 in. long.
Flowers small, dull white, with an offensive smell.	*Flowers* small, white, inodorous.
Bracts small, lanceolate, caducous.	*Bracts* solitary, filiform and often very long.
Sepals ovate-lanceolate, incurved, mealy.	*Sepals* ovate-oblong.
Staminal tube 10-ribbed, hairy inside, each of the ten teeth of the mouth divided into 3 4 or 5 short subulate segments.	*Staminal tube* with the segments of its mouth minute and filiform.

Specimens of both trees were growing in the Calcutta Garden when Roxburgh described them, the one having been received from Sunda, the other from Malabar. Roxburgh, of whose sagacity and judgment one has a thousand examples, considered them as quite distinct, and it would take a great deal more evidence than has been produced to make me believe that they are conspecific. The Malabar plant (*M. robusta*) is clearly the same as the Ceylon species which has since been identified with *M. composita*, Willd., Sp. Plantar. II 559. I cannot however agree to the view, first put forward by Mr. Hiern, that *M. composita* Willd. should be reduced to *M. dubia*, Cav. Cavanilles describes three species of *Melia*, *viz.*, *M. azedarach*, *azedirachta*, and *dubia*, and he gives figures of the first two, but not of *M. dubia*. He describes flowers of the latter as like those of *M. Azadirachta* in size, the staminal tube as 6-toothed with a possibility of more teeth ("*an pluribus?*"), and the stigma as peltate. Now, as a matter of fact, the flowers of *M. composita* Willd. are in size and other respects like those of *M. Azidarach*, and not like those of *M. Azadirachta*. The mouth of the staminal tube is many-toothed, and the stigma is ovoid, 5-toothed, and not peltate. Cavanilles' description points to a plant belonging to some other genus than *Melia*, whatever the "original specimen" named *M. dubia* in the Herbarium of the University of Rostock may be; and it is on that specimen which the reduction of *M. composita* to *M. dubia* is based. (See Hiern in Hook. fil. Fl. Br. Ind. I, 545.) No authentic specimen of *M. superba* is, so far as I know, in existence (the specimens issued by Wallich, under this name, being really *M. robusta*, Roxb.). In my opinion *M. superba* Roxb., (the Sunda *i.e.*, Malayan) species, cannot on account of its staminal tube (densely villous internally and with numerous minute teeth at the mouth) be included, like *M. robusta*, Roxb., under *M. composita*, Willd. For the teeth of the mouth of the staminal tube of the latter are at most bifid, while its inner surface is nearly glabrous. The only specimens of *Melia* known to me which fits Roxburgh's description in these and other respects, were collected in Burma by the late S. Kurz, and were described by him under the name *M. birmanica*, (Journ. As. Soc. Bengal, 1874, ii. 183; For. Flora Burmah, I, 213). And I know of no other specimens of *M. birmanica* than those of Kurz's collecting. Certainly Maingay's No. 317 (Kew Distrib.) is not the same, as I have determined by dissecting flowers of both. *M. composita*, Willd., is not really very distinct from the Japanese *M. Toosedan*, Sieb. and Zucc., which, in turn, is closely allied to *M. Azadirach*. There are, by the way, in the Calcutta Herbarium, specimens from the Khasia Hills, Munipore, the plains of Assam and also from Sumatra, which, as far as I see, cannot be distinguished from Japanese specimens of *M. Toosedan*. If this identification be correct, the geographical area of the latter species will have to be largely extended.

M. Azadirachta, Linn., is not found in the Malayan Provinces even planted. But *M. Azadarach*, Linn., is very common planted. It presents several varieties, some of which have been elevated to the rank of species.

Roxburgh describes a Penang plant which he names *Melia tomentosa*. Of this no specimen is known now to exist. But he left an excellent coloured drawing of it in the Calcutta Herbarium, which shows it to be no *Melia* but a *Chisocheton*. Jack describes (Malayan Miscellanies I, 12) a Penang species which he named *Melia excelsa*. The only specimens known of this are what Wallich issued (under this name) as No. 1253 *b*. of his catalogue. The only Wallichian specimens of this which I have seen are without flowers: they have simple long pinnate leaves, and their *facies* is not that of *Melia* but of some other genus.

2. MELIA AZIDARACH, Linn. Sp. Pl. ed. I., 384. A small tree; young branches rather slender, at first scurfy-puberulous, afterwards dark-coloured and glabrous. *Leaves* 1·5 to 2 feet long, bi-pinnate, glabrous when adult; pinnæ about 3 pairs, the uppermost often 3-foliolate; pinnulæ 5 to 7, opposite or sub-opposite, obliquely ovate or oblong-ovate, acuminate, shortly petiolulate, 1·5 to 2 in. long, when young coarsely serrate, when adult serrulate or sub-entire. *Panicles* shorter than the leaves, shortly pedunculate, spreading, lax, few-flowered, at first stellate-puberulous but ultimately glabrous. *Flowers* ·35 in. long. *Calyx-lobes* oblong-lanceolate, pubescent. *Petals* flat, oblanceolate-spathulate, puberulous. *Staminal tube* lilac, expanding at the 30-toothed mouth, glabrous

outside, sparingly pubescent inside. *Style* clavate at the apex; *stigma* 10-lobed. *Drupe* oblong, smooth yellowish, ·6 or ·7 in. long. Linn. Hort. Cliff. 161; Cav. Diss. 7 t. 393, p. 207; Roxb. Hort. Beng. 33; Fl. Ind. ii. 395; Wight Ic. t. 160; Wall. Cat. 1250; DC. Prod. i, 621, Boiss. Fl. Orient. i. 954; W. & A. Prodr. i. 117; Adr. Juss. in Mém. Mus. xix. t. 13, f. 4; Bot. Mag. t. 1066; Bedd. Fl. Sylvat. t. 13; Brandis For. Flor. 68; Miq. Fl. Ind. Bat. I, Pt. 2, p. 533; Ann. Mus. Lugd. Bat. V. 5; Kurz For. Flora Burmah. I, 212; Hiern in Hook. fil. Fl. Br. Ind. I, 544; C. DC. Monog. Phan. I, 451. *M. sempervirens, Sw. Prodr. 67; Bot. Reg.* t. 643; *Roxb. Hort. Beng.* 33; *Fl. Ind.* ii. 395; *Wall. Cat.* 1252; *Dalz. & Gibs. Bomb. Fl. Suppl.* 15. *M. Bukayun, Royle Ill. Bot.* 144; *Griff. Itin. Notes* 355, 403.

Planted in most of the Provinces, and in all the warmer parts of both the Old and New Worlds.

2. SANODRICUM, Cav.

Trees with trifoliolate, coriaceous, entire leaflets, the lateral with a short, the terminal with a long petiolule. *Flowers* pentamerous with imbricate æstivation, in axillary panicles. *Calyx* cup-shaped, its tube adnate to the base of the ovary, its lobes short. *Petals* free, oblong, obtuse. *Staminal tube* cylindric, nearly as long as the petals, the mouth 10-toothed. *Anthers* 10 or 8, included. *Disk* tubular, embracing the ovary and base of the style. *Ovary* immersed in the calyx-tube, narrowed upwards into the columnar style, 5-celled, each cell with 2 collateral pendulous ovules. *Style* clavate at the apex. *Stigmas* 5, erect, sub-cylindric, fleshy, each surrounded at the base by a fleshy ring. *Berry* superior, sub-globular, fleshy, indehiscent, 3·5-celled, and with as many arillate seeds; the aril papery outside, pulpy inside. DISTRIB: About seven species—all Indo-Malayan.

Stigmas united, radiating, their apices recurved ... ... 1. *S. radiatum.*
Stigmas distinct, erect, sub-cylindric.
  Staminal tube cylindric, ventricose in the upper half ... ... 2. *S. Maingayi.*
  Staminal tube cylindric, not ventricose.
    Leaflets emarginate ... ... 3. *S. emarginatum.*
    Leaflets more or less acuminate ... 4. *S. indicum.*

1. SANDORICUM RADIATUM, King, n. sp. A tree 40 to 80 feet high. *Leaves* 6 to 12 in. long; leaflets sub-coriaceous, broadly ovate, sub-oblique, acute or shortly acuminate, the base slightly cuneate; upper surface glabrescent or glabrous, the lower pubescent on the midrib and 8 to 10 pairs of spreading sub-prominent nerves; length 3 to 6 in.,

breadth 1·75 to 4 in.; petiolules ·2 to ·5 in., the terminal one 1·5 to 2·5 in. *Panicles* with few short branches, slender, 3 to 5 in. long, few-flowered, lax. *Flowers* ·25 in. long; the pedicels about as long, slender, puberulous. *Calyx* cupular, less than half as long as the petals, with 5 shallow broad sub-acute teeth, puberulous. *Petals* narrowly elliptic, longer than the staminal tube. *Staminal tube* cylindric, not ventricose, ridged, glabrous, its mouth with ten subulately bifid teeth: anthers ovate with broad bases, included. *Ovary* cylindric, tapering into the short style; stigmas radiating, their apices recurved. *Fruit* unknown.

Perak: Wray No. 3345; King's Collector No. 6001. Singapore: Ridley No. 4822.

This differs from the other three species in its stigmas which unite to form a radiate discoid mass, the edges being recurved; while the other three species have erect slender un-united stigmas.

2. SANDORICUM MAINGAYI, Hiern in Hook. fil. Fl. Br. Ind. I, 554. A tree. *Leaves* 6 to 8 in. long: leaflets elliptic, sub-glabrous, sub-acuminate, the base obtuse or sub-acute; main nerves 6 to 8 pairs, depressed on the upper, prominent on the lower surface, spreading; length 2 to 5 in., breadth 1·5 to 3 in.; petiolules ·35 in., the terminal one 1·25 to 1·75 in. *Panicles* shorter than the leaves, lax, puberulous. *Flowers* ·35 to ·45 in. long, their pedicels of about the same length; bracteoles minute, subulate. *Calyx* fleshy, obscurely toothed, minutely pilose. *Petals* three times as long as the calyx, fleshy, elliptic, blunt, glabrous. *Staminal-tube* cylindrical, ventricose in the upper half, ridged; the mouth with 10 bifid teeth. *Stigmas* erect, rather long. *Fruit* unknown. C. DeCand. Mem. Phan. I, 462.

Malacca; Maingay (Kew Distrib. No. 328).

I have seen only Maingay's Malacca specimens. They resemble S. borneense, *Miq.*, of which I have seen the type specimen; but that species has narrower and longer leaflets with more numerous lateral nerves; it has also smaller flowers.

Mr. Hiern describes this as a tree, M. C. DeCandolle as a shrub.

3. SANDORICUM EMARGINATUM, Hiern in Hook. fil. Fl. Br. Ind. I, 553. A tree. *Leaves* 5 to 7 in. long; leaflets obovate to elliptic, the apex emarginate and usually mucronate, slightly narrowed to the oblique base; main nerves 5 to 6 pairs, spreading, slightly prominent; length 2 to 3·5 in., breadth 1·25 to 2 in., petiolules ·35 to ·5 in., the terminal one 1 to 1·25 in. *Panicles* short, dense; flowers ·2 in. long, shortly pedicellate. *Calyx* cup-shaped, slightly accrescent. *Staminal-tube* with 8 or 10 sub-glabrous emarginate teeth. *Fruit* (immature) sub-globular or obovoid, densely and minutely tomentose. C. DeCand. Mem. Phan. I, 461. *S. Beccarianum*, Baill. in Adansonia, 264.

Malacca: Maingay (Kew Distrib. No. 331).

I have seen only Maingay's imperfect specimens of this. The above description is copied chiefly from Hiern.

4. SANDORICUM INDICUM, Cav. Diss. VII, p. 359, tt., 202, 203. A tree 30 to 40 feet high. *Leaves* 9 to 18 in. long; leaflets broadly ovate to ovate-rotund, shortly and abruptly acuminate, the base rounded or sub-cuneate, slightly unequal; main nerves 8 to 12 pairs, spreading, impressed on the upper, prominent on the lower surface when dry; upper surface glabrous, lower pubescent or puberulous, becoming glabrescent when old; length 4 to 8 in., breadth 2 to 4·75 in.; lateral petiolules 3 to 4 in., terminal 2 to 3 in. *Panicles* several, scattered near the apices of the branches, only a few inches long, few-flowered, minutely rusty-tomentose. *Flowers* ·4 or ·5 in. long; pedicels ·25 in., pubescent. *Calyx* minutely tomentose. *Petals* linear-elliptic, obtuse, fleshy, glabrous. *Staminal tube* narrow, fleshy, striate, glabrescent outside and puberulous inside. *Fruit* sub-globose, obtusely 5-angled at least when young, densely but minutely pubescent, 1·5 to 2 in. in diam., filled with a yellowish acid edible pulp; arillus with many spongy woody fibres; seed brown, glossy. W. & A. Prodr. i. 120; Blume Bijdr. I. 163; Adr. Jus. in Mem. Mus. xix. t. 16, f. 15; Hassk. Retzia, i. 146; Roxb. Cor. Pl. iii. 58, t. 261; Fl. Ind. ii. 392; Wall. Cat. 1249; Kurz For. Fl. Burma, I, 217; Heirn in Hook. fil. Fl. Br. Ind. I, 553; De Cand. Mon. Phan. I, 461; Miq. Fl. Ind. Bot. I Pt. 2., p. 541. *Sandoricum nervosum*, Blume Bijdr. I., 165; Miq. in Ann. Mus. Lugd. Bat. IV, 30. *S. ternatum*, *Blanco Fl. Filip. ed.* i. 346. *S. glaberrimum*, *Hassk. Retzia*, i. 145. *Trichilia nervosa*, *Vahl Symb.* i. 31. *Melia Koetjape*, *Burm. Fl. Ind.* 101. *T. venosa*, *Spreng. Syst.* iii. 68.

In all the Provinces except the Nicobar Islands. DISTRIB. Siam; the Malayan Archipelago, Burma.

The fruit of this is edible, and on that account the species is occasionally cultivated.

3. MEGAPHYLLÆA, Hemsl.

A tree. *Leaves* large, pinnate; leaflets opposite, slightly oblique. *Panicles* extra-axillary, narrow and raceme-like, shorter than the leaves. *Flowers* more than 1 in. across when expanded *Calyx* cupular, fleshy, sub persistent, annulate and thickened below the middle; its tube adnate to the base of the ovary, its mouth irregularly 3 to 5-lobed. *Petals* 10, narrowly elliptic, thickly coriaceous, in two rows, free, imbricate. *Staminal-tube* cylindric, its mouth obscurely crenulate; anthers 10, included. *Disk* cushion-shaped, many-lobed. *Ovary* seated on the disk, depressed, 7- to 9-celled; style thick, stigma capitate, ovules one from the central angle of each cell. *Capsule* large, sub-spherical, 7- to

9-lobed, 7- to 9-celled, the pericarp very thick. *Seeds* exalbuminous, compressed, exarillate, glabrous, with large hilum and conferruminate cotyledons.

DISTRIB. A single Malayan species.

MEGAPHYLLÆA PERAKENSIS, Hemsl. in Hook. Ic. Plant. t. 1708. A tree 20 to 40 feet high. *Leaves* when adult 6 or 7 feet long (*fide* Hemsley), glabrous, the petiole and rachis compressed; leaflets oblong, sub-coriaceous, sub-acute; the base oblique, sub-truncate or cuneate; the larger 12 to 15 in. long, 3 to 4 in. broad; petiolules ·35 to ·75 in.; main nerves 10 to 12 pairs, spreading, curving, slightly prominent beneath. *Panicles* 16 to 20 in. long; the lateral branches short, racemose, few-flowered; the main rachis 4-angled, compressed. *Flower-buds* clavate, narrowed into a pseudo-stalk as long as the pedicel proper. *Flowers* 1 in. long, and about 1·25 in. in diam. when expanded, their pedicels ·35 in. long. *Calyx* shortly cylindric, with a thick lobulated ring outside near the thickened base, puberulous outside. *Staminal-tube* shorter than the petals, pubescent inside below the insertion of the anthers, otherwise glabrous. *Anthers* elliptic. *Ovary* and lower half of style minutely tomentose. *Fruit* globular-pyriform, densely but minutely tomentose, about 3 in. in diam.; the pericarp 1 in. thick. *Seeds* 1 in. long.

Perak; at elevations of 3,000 to 4,000 feet, Scortechini, Wray, Curtis, King's Collector.

This genus was placed by its author provisionally next to *Chisocheton* to which it is no doubt closely allied, the points in which it chiefly differs from that genus being its two-ranked petals and 7- to 9-celled ovary. I give the length of the leaves as 6 to 7 feet on the authority of Mr. Hemsley who, in his figure, shows the leaflets as very numerous. None of the Herbarium specimens which I have seen enable me to estimate either the length of the former or the number of the latter.

4. CHISOCHETON, Blume. (*Schizochiton.*)

Trees or shrubs. *Leaves* equally pinnate; leaflets entire, opposite or sub-opposite, more or less oblique. Flowers polygamo-diœcious, in extra-axillary, rarely axillary, divaricately-branched panicles and numerous; or in spike-like racemes or cymes and few. *Calyx* small, cup-shaped or cylindric, entire or 4-5-toothed. *Petals* 4–5 or more, usually linear-elongate or cylindric, at first cohering in a tube especially below, at length spreading, somewhat imbricated or valvate. *Staminal tube* elongate, slender, tubular, 4 to 12-lobed at the apex, lobes entire or toothed; anthers linear, equal in number to and alternate with the lobes, included or somewhat exserted. *Disk* short and fleshy, or tubular. *Ovary* short, 2- 4-celled; style filiform, usually exceeding the staminal tube; stigma capitate or cylindric, usually with a ring at its base; ovules usually one in each cell. *Capsule* sub-globose, often beaked, thickly coriaceous, 2- 4-celled. *Seeds* often enclosed in an imperfect aril; cotyledons usually peltate.—Distrib. An Indo-Malayan genus of about 22 species.

- *Inflorescence only a few inches long, much shorter than the leaves, spike-like, few-flowered; fruit beaked.*
  - Flowers ·5 in. long, narrowly cylindrical in bud ... ... 1. *C. spicatus.*
  - Flowers ·9 in. long, widely cylindrical in bud ... ... 2. *C. pauciflorus.*
- *Inflorescence extra-axillary, spike-like, a foot long or upwards, including the peduncle.*
  - Flowers confined to the terminal two inches of the inflorescence, the peduncles very much longer; flowers ·5 or ·6 in. long, 4-merous, cylindric in bud; fruit beaked ... ... 3. *C. Kunstleri.*
  - Flowers on short lateral branches scattered along the rachis of the inflorescence.
    - Flowers ·75 to ·1 in. long, 4- or 5-merous, clavate in bud; fruit beaked 4. *C. penduliflorus.*
    - Flowers 1·25 to 1·5 in. long, cylindric in bud; petals 7 to 9; fruit not beaked ... ... 5. *C. rubiginosus.*
  - Flowers on distant lateral glomeruli 1·25 to 1·5 in. long; petals 5; fruit subglobular, not beaked ... ... 6. *C. princeps.*
- *Inflorescence extra-axillary, paniculate.*
  - Young shoots, under surfaces of leaves, petioles, and inflorescence pubescent or tomentose.
    - Panicles as long as the leaves; flowers ·25 in. long; petals 4, anthers much exserted from staminal tube ... 7. *C. glomeratus.*
    - Panicles about half as long as the leaves; flowers ·45 in. long; anthers included in staminal tube ... 8. *C. erythrocarpus.*
  - Rachises of leaves and both surfaces of leaflets minutely pubescent; panicles

puberulous; flowers ·5 to ·6 in. long, their buds very clavate; calyx with an annulus below its teeth ... ... 9. *C. annulatus.*

Rachises of leaves sub-glabrous; midrib and nerves of leaflets minutely pubescent on the lower surface when young; flowers ·5 to ·6 in. long, cylindric in bud; calyx not annulate ... ... 10. *C. macrophyllus.*

Leaves everywhere glabrous.

Petals 5; leaflets 2 to 4 pairs; panicles longer than the leaves, much branched; flowers ·5 in long; staminal tube truncate with about 14 broad shallow teeth ... ... 11. *C. macrothyrsus.*

Petals 4.

Mouth of staminal tube almost entire, slightly waved; flowers ·4 or ·5 in. long ... ... 12. *C. laxiflorus.*

Mouth of staminal tube with 6 long lanceolate teeth.

Flowers greenish-white, fœtid; fruit pyriform, glabrous, deep red in colour... 13. *C. patens.*

Flowers yellow, fragrant; fruit turbinate-globular, yellow when ripe ... 14. *C. divergens.*

1. CHISOCHETON SPICATUS, Hiern in Hook. fil. Fl. Br. Ind. I, 550. A tree about 30 feet high; young shoots and inflorescence deciduously tawny-tomentose. *Leaves* 8 to 12 in. long, equally pinnate; leaflets 2 or 3 pairs, opposite, membranous, oblong-lanceolate to elliptic or ovate, shortly and bluntly acuminate, the base cuneate, slightly oblique; upper surface quite glabrous, the lower with the nerves and midrib puberulous; main nerves 4 to 6 pairs, curving; length 2·5 to 5 in., breadth 1·35 to 2 in., petiolules ·25 to ·35 in. *Panicles* spike-like, axillary, 2 to 3 in. long, angled, adpressed-pubescent, few-flowered. *Flowers* ·5 in. long, their pedicels about ·1 in., pubescent. *Calyx* deeply cup-shaped, tomentose, the mouth truncate sub-entire or irregularly toothed. *Petals* 5 (sometimes 4 ?) much larger than the calyx, narrowly elliptic, united by their edges, and densely and minutely adpressed rusty-tomentose outside, glabrous inside. *Staminal tube* nearly as long as the petals, narrowly cylindric, densely adpressed-pubescent outside, the mouth with 5 broad teeth. *Stamens* 5, elongate, narrow, inserted

below the mouth, included. *Ovary* narrowly elliptic; the style long, cylindric; stigma capitate with a large central mamilla. *Fruit* transversely oblong, tapering to each end, the upper end compressed, acute, the lower terete, minutely rusty-tomentose; seeds two, sub-compressed, ·5 in. in diam., length (including the tapering ends) nearly 2 in., breadth ·75 in. C. DeCand. Mon. Phan. I, 535.

Malacca: Maingay (Kew Distrib.) No 363. Perak: Scortechini. DISTRIB: Sumatra, Borneo.

The fruit of this is very peculiar, being in shape something like a spear-head. The central part, in which the two seeds are contained, is transversely-oblong and thick; above this is a long compressed conical prolongation filled with a little pulp, while at the base the fruit is gradually narrowed into a stalk. The sparsely-flowered spike-like inflorescence is also peculiar in the genus.

2. CHISOCHETON PAUCIFLORUS, King, n. sp. A shrub or small tree; young shoots slender, puberulous, the bark dark when dry. *Leaves* 5 to 15 in. long, equally pinnate; leaflets thinly coriaceous, 2 rarely 3 pairs, oblanceolate or oblong-lanceolate, sometimes ovate or elliptic, shortly and rather abruptly acuminate, the base cuneate; the upper surface glabrous, shining; the lower dull, glabrescent, reticulate, puberulous on the midrib and nerves; main nerves 5 or 6 pairs, ascending, curving, slightly prominent beneath; length 2·5 to 9 in., breadth 1 to 4 in., petiolules ·1 to ·2 in. *Panicles or racemes* from 1 to 3·5 in. long, extra-axillary, puberulous, 2- to 6-flowered. *Flowers* about ·9 in., long; their pedicels ·25 to ·5 in., puberulous. *Calyx* fleshy, tubular, the mouth entire and truncate or with 4 or 5 shallow teeth, tomentose, about ·25 in. long. *Petals* 4 or usually 6, free, about ·8 in. long, fleshy, spathulate-elliptic or elliptic, blunt, minutely tomentose outside, glabrous inside. *Staminal tube* nearly as long as the petals, sub-glabrous, obscurely toothed at the mouth; the anthers from 4 to 8 or 10, varying with the number of petals, small, elliptic, included. Disc small, flat, tomentose. *Ovary* conical, tapering into the long cylindric style, sometimes narrowly cylindric (probably abortive). *Stigma* cylindric, obscurely 4-lobed at the apex. *Fruit* (unripe), elliptic, with a stout acute apical beak, tapered at the base, everywhere tomentose, the calyx persistent and slightly accrescent.

Perak: Scortechini; Wray, No. 2681; King's Collector, Nos. 3128, 3313, 3396, 3467 and 4455.

This species resembles *C. spicatus*, Hiern, in leaves; but has much larger flowers. Its fruit is as yet unknown. This also resembles *C. diversifolius*, Miq., in leaves, but has larger flowers.

3. CHISOCHETON KUNSTLERI, King, n. sp. A shrub 6 to 20 feet

high. *Leaves* 12 to 18 in. long, their petioles and rachises rusty-tomentose; leaflets 3 to 5 pairs, oblong-oblanceolate or lanceolate, cuspidate, slightly narrowed to the cuneate base. Upper surface glabrous except the tomentose midrib; under surface rusty-tomentose, the 16 to 18 pairs of spreading curving main nerves prominent. *Spikes* supra-axillary, solitary, on very long peduncles, rusty-tomentose; peduncles 6 to 12 in., the flowering part about 2 in. *Flowers* ·5 to ·6 in. long, crowded, subsessile, minutely bracteolate. *Calyx* cylindric, about ·1 in. long, densely tomentose, the mouth with 4 minute teeth. *Petals* 4, oblong, concave at the apex, yellowish, sericeous outside, glabrous inside. *Staminal tube* shorter than the petals and coherent with them below, glabrous, with a few scattered coarse hairs near the middle outside, the mouth with 4 broad emarginate or erose teeth; anthers 4, elliptic, included. *Ovary* ovoid, sericeous; style cylindric with a few scattered hairs, stigma cylindric with a thin annulus at its base. *Fruit* sub-globular, tomentose, with a long thick apical beak, ·75 in. in diam., the beak ·5 in. long.

Perak: King's Collector, Nos. 4502, 7783, Scortechini.

4. CHISOCHETON PENDULIFLORUS, Planch. ex Hook. fil. Fl. Br. Ind. I, 550. A shrub or small tree; young branches tawny-tomentose. *Leaves* 15 to 24 in. long, their rachises tawny-tomentose: leaflets 5 pairs, opposite, with occasionally a terminal odd one, elliptic to ovate, the upper occasionally sub-obovate, all shortly acuminate; rounded at the base, or narrowed from above the middle to the sub-acute minutely cordate sub-oblique base; main nerves 15 to 18 pairs, spreading, rather prominent beneath; upper surface glabrescent, the midrib and nerves pubescent; the lower reticulate, sparsely pubescent, the midrib tomentose: length 3 to 9 in., breadth 1·5 to 3 in., petiolules less than ·1 in., tomentose. *Panicles* about as long as the leaves, supra-axillary, on long drooping tomentose slender peduncles; the lateral branches few, short, densely flowered. *Flowers* ·75 to nearly 1 in. long, on very short pedicels, dull red, 4- or 5- merous, clavate in bud, the lower part very slender especially in the barren flowers. *Calyx* short, tubular, the mouth entire or 4- or 5- toothed, coarsely pubescent. *Petals* 5, linear-spathulate, concave and thickened towards the apex, longer than, and in their lower part coherent with, the staminal tube, pubescent in the middle and glabrous on the edges outside. *Staminal tube* narrow, with a few coarse adpressed hairs near the apex outside, the mouth rather deeply 3- to 6- toothed, the teeth emarginate or erose. *Anthers* 3 to 5, narrow, elongate, sessile, included or slightly exserted. *Ovary* sub-ovoid, short, sub-glabrous. *Style* long, slender, adpressed-pubescent below, glabrous above. *Stigma* discoid, thick, surrounded at the base

by an annular band. *Fruit* (unripe) ovate, tomentose, on a very short thick stalk, ·75 in. diam.; the apex with a curved thick blunt beak. C. De Cand. Mon. Phan. I, 536. *Melia penduliflora*, Wall. Cat. No. 1255.

Penang; Porter, Curtis. Malacca: Maingay (Kew Distrib.) No. 325. Perak; Scortechini, Wray, King's Collector.

In this species the flowers are of two kinds. One set, which are longer than the other, are very conspicuously clavate, the lower part being filiform; in these the ovary is small and infertile and the stamens are included. The other set have shorter thicker less clavate flowers, fertile ovaries, and exserted stamens.

5. CHISOCHETON RUBIGINOSUS, King n. sp. A tree 20 to 30 feet high. *Leaves* 2 to 3 feet lōng, the petiole and rachises tawny-tomentose, sub-compressed. *Leaflets* 4 to 8 pairs, coriaceous, sub-opposite, elliptic to oblong, very shortly acuminate, slightly narrowed to the rounded minutely sub-cordate base: upper surface glabrous, except the tomentose midrib and main nerves, sub-reticulate; the lower reticulate, rusty-pubescent; main nerves 12 to 18 pairs, spreading, rather straight, prominent beneath; length 5 to 12 in., breadth 2·5 to 4 in., petiolules about ·1 in. *Panicles* spike-like, supra-axillary, about half as long as the leaves, on long peduncles, the branches very short and crowded near the apex, bracteolate. *Flowers* rather crowded, 1·25 to 1·5 in. long, on very short pubescent pedicels. *Calyx* cylindric, cup-like; the mouth truncate, entire or with 8 or 10 shallow irregular teeth; tomentose outside, glabrous inside. *Petals* usually 7 sometimes 8 or 9, linear, sub-spathulate, slightly concave and thickened at the apex, 1 to 1·25 in. long, tomentose externally, glabrous internally. *Staminal tube* shorter than the petals and free from them, narrowly cylindric and glabrous below, slightly expanded and pubescent at the mouth; mouth with 10 to 15 linear erect teeth: anthers from 10 to 15, elongate, alternating with the teeth and of about the same length. *Ovary* ovoid, sericeous like the cylindric style; stigma cylindric. *Fruit* (unripe) ovoid, rugose, densely rusty-tomentose, 1·5 in. long.

Perak: Scortechini, Wray, King's Collector.

This species is allied to *C. princeps*, Hemsl., but has a different inflorescence and smaller leaves. I think it possible that this *may* be *Melia tomentosa* Roxb., a species from Penang, of which there is no specimen extant, but of which there is a drawing (reduced in size) in the Calcutta Herbarium. The only serious discrepancy is that Roxburgh describes and figures only five petals; whereas in all the Perak specimens which I have examined there are at least 7, and in many 8, or 9, and in one even 10 petals.

6. CHISOCHETON PRINCEPS, Hemsley in Hook. Ic. Plant. t. 1844.

An unbranched tree 40 feet high. *Leaves* 9 to 10 feet long; the rachises somewhat compressed, puberulous. *Leaflets* coriaceous, opposite, oblong, acute, the base rounded and slightly oblique: upper surface rugulose, shining, glabrous except the tomentose midrib and main nerves; lower surface reticulate-areolate tawny-pubescent; main nerves 15 to 30 pairs, spreading and little curved; length 9 to 18 in., breadth 2·5 to 4·5 in.; petiolule ·3 in., stout. *Panicles* spike-like, 3 feet or more in length; the branches distant, sub-sessile, glomeriform, each crowded with 20 to 30 elongate obovate shortly pedicellate flowers 1·25 to 1·5 in. long. *Calyx* ·2 in. long, about one-seventh of the length of the petals, cupular, entire or with 3 or 4 rudimentary teeth, truncate, puberulous. *Petals* 5, linear-spathulate, concave at the apex, adpressed-sericeous outside, glabrous inside. *Staminal-tube* slightly adherent to and shorter than the petals, cylindric, slightly wider at the minutely 10-toothed mouth; villous in the lower half inside, otherwise glabrous; anthers 10, short, linear, sub-included. *Ovary* small, cylindric, 5-grooved, surrounded by a small annular disc. *Style* cylindric, sparsely pubescent, slightly longer than the staminal-tube, cylindric. *Fruit* sub-globular, the apex depressed, the sides vertically grooved, rusty-tomentose, 2·5 in. in diam. *Seeds* 3 to 5, 1·75 in. long.

Penang: Curtis No. 1519.

A remarkable species with very long pendulous leaves.

7. CHISOCHETON GLOMERATUS, Hiern in Hook. fil. Fl. Bl. Ind. I, 551. A tree 40 to 70 feet high; young shoots deciduously tomentose, the bark dark when dry. *Leaves* 12 to 18 in., the petiole and rachises pubescent; leaflets 2 or 3, rarely 4 pairs, thinly coriaceous, opposite, elliptic to elliptic-oblong, very shortly acuminate, the base rounded, unequal-sided; main nerves 9 to 11 pairs, spreading, prominent beneath; upper surface minutely punctate when dry, glabrous except the pubescent nerves and tomentose midrib; lower surface softly pubescent, the midrib and nerves tomentose; length 4 to 6·5 in., breadth 1·8 to 2·5, petiolule ·1 to ·15 in. *Panicles* solitary, drooping, supra-axillary, as long as the leaves; the lateral branches rather numerous, horizontal, pedunculate, each bearing several dense many-flowered small cymes, everywhere tomentose. *Flowers* ·25 in. long, sub-sessile, minutely bracteolate. *Calyx* short, tubular, puberulous outside, sub-entire or irregularly toothed, much shorter than the corolla. *Petals* 4, erect, elliptic, slightly concave, glabrescent. *Staminal-tube* much shorter than the petals and coherent with them, rather wide, glabrescent, the mouth with 6 to 8 long linear teeth. *Anthers* linear, elongate, much exserted. *Ovary* ovoid, tapering into the cylindric style, and like it tomentose. *Stigma* cylindric, rather long, glabrous. *Fruit* (immature) sub-globular, on thick slightly curved pedicels,

not apiculate, but tapering at the base into a short pseudo-stalk, rusty-tomentose, 1 in. in diam., seeds two. C. De Cand. in Mon. Phan. I, 532. *Schizochiton?* Wall. Cat 9040.

Penang, Porter. Perak: King's Collector, Nos. 8462, 10227, 10624.

I am not satisfied that two closely allied species are not united under the above, as there is some difference in the number of main nerves in the leaflets, those in the specimens of King's Collector, No. 8462, being rather less numerous than in the other gatherings.

8. CHISOCHETON ERYTHROCARPUS, Hiern in Hook. fil. Fl. Br. Ind. I, 550. A tree; young branches rather stout, densely and minutely rusty-tomentose. *Leaves* equally pinnate, 12 to 15 in. long; leaflets 4 to 6 pairs, opposite, coriaceous, elliptic-oblong to broadly ovate, shortly abruptly and bluntly acuminate, cuneate or rounded at the slightly oblique base; upper surface glabrous except the puberulous midrib; lower softly and shortly rusty-pubescent; main nerves 6 or 7 pairs, ascending, curving; length 2·5 to 5·5 in., breadth 1·35 to 2 in., petiolules 2 in. *Panicles* clustered towards the ends of the branches, extra-axillary, about half as long as the leaves, minutely rusty-tomentose; their lateral branches short, horizontal, cymose. *Flowers* ·45 in. long, their pedicels shorter. *Calyx* cylindric, the mouth truncate, sometimes minutely toothed, densely tomentose. *Petals* 6, longer than the calyx, fleshy, narrowly elliptic, blunt, adpressed-sericeous outside, glabrous inside. *Staminal-tube* shorter than the petals and pistil, outside sericeous below and glabrous above, inside villous, with 5 or 6 rather deep blunt emarginate teeth; anthers 5 or 6, included, elongate. *Ovary* narrow, pubescent; *style* tapering; *stigma* cylindric, with glabrous central mammilla. *Fruit* sub-globose, nearly 2 in. in diam., minutely tomentose, blood-red (fide Maingay) when ripe. *Seeds* ex-arillate, flattened, 1 in. long, the testa thick, orange-red. C. De Cand. in Mon. Phan. I, 534.

Malacca: Maingay (Kew Distrib.) No. 322.

9. CHISOCHETON ANNULATUS, King n. sp. A tree; *leaves* 18 to 30 in. long, the petioles and rachises 4-angled, pubescent; leaflets 4 to 7 pairs, membraneous, oblong or elliptic-oblong, shortly and abruptly acuminate, the base cuneate, both surfaces with very minute pubescence; main nerves 12 to 14 pairs, oblique, rather prominent beneath; length about 9 in., breadth 3 to 3·5 in., petiolules ·25 in. *Panicles* solitary, supra-axillary, puberulous, about as long as the leaves, with scanty spike-like few-flowered branches which become shorter upwards. *Flower-buds* clavate, ·5 to ·6 in. long, contracted into a pseudo-stalk at the base, their true pedicels ·25 in. long. *Calyx* campanulate, rusty-tomentose outside, completely enveloping the petals in bud, with a thickened wavy band

about its middle, and 4 broad convenient triangular teeth. *Petals* 6 or more, the outer three sericeous outside and glabrous inside, the inner quite glabrous; all broadly elliptic, free from the staminal-tube. *Staminal-tube* shorter than the petals, cylindric, glabrescent, the mouth with shallow broad erose teeth. *Stamens* 12, attached at the very base of the tube; anthers linear-elongate. *Ovary* conic, apparently 5-celled; *style* cylindric, pubescent; *stigma* discoid, concave.

Perak; Scortechini No. 7000, Curtis No. 2693.

In its leaves, and also to some extent in its inflorescence, this agrees with the type specimen of *C. spectabile*, Miq., collected by Korthals in Borneo, and now in the Herbarium at Leiden. That specimen is in bud only, and neither Scortechini's nor Curtis's specimens have fully expanded flowers. The buds both of this and of *C. spectabile* are of the same clavate shape. Miquel does not describe the flowers of *C. spectabile*, and the buds in Korthal's type specimen are so young and so few, that I did not dare to dissect one of them. The buds on Scortechini's scanty specimens of this are also too young for accurate examination. But an examination of one of Mr. Curtis's discloses the structure above described. The flowers are remarkable because of the waved thickened band which runs round the exterior of the calyx just below the teeth. The ovary, moreover, of this appears to have 5 cells, whereas the species of the genus *Chisocheton* have only 2 or 4. This character together with the lengthening of the base of the flower into a pseudo-stalk and the annular thickening of the base of the calyx, approximate this species to the genus *Megaphyllea*. In the meantime I put it into *Chisocheton*. Good flowering specimens of this singular plant are much to be desired.

10. CHISOCHETON MACROPHYLLUS, King, n. sp. A tree 60 feet high. *Leaves* 5 or 6 feet long, the petiole and rachis obliquely 4-angled, subglabrous; leaflets membranous, opposite, oblong, the apex with a short blunt acumen; the base broad, rounded, unequal-sided: upper surface quite glabrous, the lower paler, minutely pubescent on the midrib and nerves when young; main nerves 18 to 20 pairs, spreading, rather prominent beneath when dry; length 5 to 13 in., breadth 3·5 to 4 in., petiolules ·3 in. *Panicles* 2 to 3 feet long, narrow, puberulous; the branches rather distant, from 1 to 3·5 in. long, the ultimate branchlets cymulose, many-flowered. *Flowers* ·5 or ·6 in. long, narrow, on pubescent pedicels less than ·1 in. long. *Calyx* cupular, pubescent, about ·05 deep, its mouth obscurely 4-toothed or entire. *Petals* 4, many times longer than the calyx, linear with spathulate concave apices, puberulous on the outer, glabrous on the inner surface. *Staminal-tube* slightly shorter than the petals, adherent to them for half its length, outside glabres-

cent below but hairy near the mouth; inside villous; mouth wider than the tube with 8 rather deep linear 2- to 3- toothed lobes; *anthers* oblong, slightly exserted. *Ovary* broadly ovoid, sericeous like the slightly compressed style; *stigma* small, cylindric, with the upper surface lobed. *Fruit* sub-globular, narrowed at the base, 3 in. in diam., the pericarp leathery thick and fleshy; pedicel very stout, swollen, 1 in. long.

Penang: Curtis No. 2469. Perak: Curtis No. 2327. Singapore: Ridley No. 4767.

11. Chisocheton macrothyrsus, King, n. sp. A tree 20 to 40 feet high. *Leaves* about 2 feet long, the petiole terete, the rachis 4-angled, glabrous; *leaflets* 2 to 4 pairs, thinly coriaceous, elliptic-oblong, minutely acuminate, the base cuneate, both surfaces glabrous; main nerves 10 to 14 pairs, prominent beneath; length 3·5 to 9 in., breadth 1·5 to 3·5 in., petiolules ·25 to ·5 in. *Panicles* longer than the leaves, angled, glabrous; the branches distant, the lower again branched, the ultimate branchlets everywhere cymose. *Flowers* ·5 in. long, on very short pubescent pedicels. *Calyx* tubular, about ·1 in. long, truncate or waved, pubescent. *Petals* 5, five times as long as the calyx, elliptic, thickened and concave at the apex, minutely tomentose outside, glaberulous inside. *Staminal tube* shorter than and free from the petals, its apex truncate, with about 14 broad shallow teeth, sericeous on both surfaces except towards the apex; anthers 7 or 8, rather small, included, attached some way below the mouth. *Ovary* ovoid-conic, sericeous like the tapering style; *stigma* cylindric, glabrous, with a flat ring at its base. *Fruit* depressed-globular, sub-rugose and with several vertical ridges, minutely tomentose, 1·5 in. in diam.

Perak: Scortechini, Wray, King's Collector.

I have seen only a single specimen in which the fruit approaches maturity. The majority of the fruiting specimens are in a young stage, and the young fruits are deeply rugose and furrowed and have a small apical beak. None of the specimens I have seen have their leaves intact, and it is possible they may have more leaflets than I have described above.

12. Chisocheton laxiflorus, King, n. sp. A tree 20 to 40 feet high. *Leaves* 1 to 2 feet long, glabrous; leaflets 4 or 5 pairs, opposite, thinly coriaceous, elliptic to elliptic-oblong, cuspidate, slightly narrowed at the base, both surfaces minutely reticulate; main nerves 10 to 15 pairs, curved, ascending, depressed above and prominent beneath when dry; length 5 to 9 in., breadth 1·75 to 3 in., petiolules ·2 in. *Panicles* solitary, extra-axillary, slender, with a few primary branches; the secondary branches short, few-flowered, the flowers usually in distant pairs, sessile, ·4 or ·5 in. long. *Calyx* puberulous outside, less than ·1 in. long,

shortly cylindric, mouth entire or sometimes obscurely crenate, truncate. *Petals* 4, many times longer than the calyx, linear, obtuse, slightly concave at the apex, puberulous outside, glabrous inside. *Staminal tube* nearly as long as the petals and free from them, villous outside, glabrous inside, the mouth slightly waved. *Anthers* 5, elliptic, included. *Ovary* small (in the male flowers), sericeous. *Style* longer than the staminal tube, sericeous at the base, otherwise glabrous, stigma cylindric. *Ovary* of female flower not seen. *Fruit* depressed-globose, tapering into a short pseudo-stalk, minutely tomentose, 1·5 in. in diam., crimson when ripe.

Perak: Scortechini, Nos. 219 and 388; King's Collector, Nos. 1876, 4348, 5735, 5765, 7783.

In many respects this resembles *C. patens*, Bl., but it has larger flowers and much less pyriform fruit. The staminal tube of this is moreover only slightly toothed at the apex, whereas that of *C. patens* has 6 long lanceolate teeth.

13. CHISOCHETON PATENS, Blume, Bijdr. 169. A tree 20 to 40 feet high. *Leaves* with the petiole and rachis almost glabrous, 1 to 3 feet long; leaflets 10 to 13 pairs, opposite or sub-opposite, thinly coriaceous, oblong-lanceolate, rarely oblong-elliptic, shortly acuminate, the base narrowed and unequal-sided; both surfaces glabrous, reticulate, the lower pale and with the 10 to 14 pairs of curved spreading nerves and also the reticulations prominent; length 4 to 7 in., breadth 1 to 2·5 in., petiolule ·15 to ·4 in. *Male panicles* about as long as the leaves (the female shorter), supra-axillary, pendulous, glabrous, with numerous divergent branches the lower of which are compound, the middle spike-like, and the uppermost short and cymose. *Flowers* ·35 in. long, on short rather stout pedicels. *Calyx* cupular, puberulous outside; the mouth entire, truncate or wavy. *Petals* 4, three or four times as long as the calyx, sub-spathulate elliptic, glabrous, longer than and quite free from the staminal-tube. *Staminal tube* free from the petals, cylindric, expanding slightly upwards, pubescent near the mouth, otherwise glabrous outside, pubescent inside, the mouth with 6 long lanceolate teeth which are slightly shorter than the 6 linear elongate anthers. *Ovary* very small, surrounded by a notched fleshy glabrous disc; *style* cylindric, pubescent; *stigma* cylindric, glabrous. *Fruit* pyriform, attenuated below into a thick pseudo-stalk, glabrous; length 2·25 in. of which the stalk-like part is 1 in. Miq. Fl. Ind. Bat. Vol. I, Pt. 2, 537; Ann. Mus. Lugd. Bat. IV, 29; C. De Cand. Mon. Phan. I, 528. *C. holocalyx*, Hiern in Hook. fil. Fl. Br. Ind. I, 551. C. De Cand. l. c. 529.

Malacca: Maingay (Kew Distrib.) No. 328. Singapore; Anderson No. 30, Hullett No. 800, Ridley No. 4763. Perak: Scortechini No. 324;

King's Collector Nos. 3312, 10750; Wray No. 1279. Penang: Curtis No. 1685. Pahang Ridley No. 4765.

This species, although a much smaller tree, very much resembles *C. divergens, Bl.* in its leaves and inflorescence. The leaflets, however, are of a thicker texture than those of *C. divergens* and they dry of a different colour. The flowers of the two are almost exactly alike in structure; but those of *C. divergens* are yellow and very fragrant, while those of *C. patens* are greenish-white and have a disagreeable odour like that of *Paederia foetida* and of some species of *Lasianthus*. The fruits of the two moreover differ, those of *C. divergens* being turbinate-globular or nearly so, of a yellow colour, and more or less tomentose; while the fruits of *C. patens* are of a deep red colour and glabrous when quite ripe. I have compared the type specimens of *C. patens*, Bl. and of *C. holocalyx*, Hiern., deposited, respectively, at Leiden and Kew, and I find the two to be identical.

14. CHISOCHETON DIVERGENS, Blume, Bijdr. 169. A tree 40 to 100 feet high; young branches glabrous, the bark dark-coloured. *Leaves* 9 to 18 in. long, the main rachis deciduously puberulous; leaflets 4 to 12 pairs, membranous, opposite or sub-opposite, narrowly oblong or oblong-lanceolate, shortly acuminate, slightly narrowed to the rounded or slightly cuneate unequal base; both surfaces glabrous, reticulate, the 10 to 12 pairs of curving ascending nerves prominent on the lower when dry; length 2·5 to 6 in., breadth 1·15 to 1·75 in., petiolules ·15 to ·25 in. *Panicles* solitary, supra-axillary, pendulous, about as long as the leaves, pyramidal, the lower branches of the male panicles 6 or 7 in. long, of the female 4 or 5 in., the ultimate branchlets of both cyme-like, dense, many-flowered. *Male Flowers* ·25 in. long, on short pubescent pedicels. *Calyx* cupular, puberulous, the mouth entire or waved. *Petals* 4, three or four times as long as the calyx and slightly longer than the staminal-tube, recurved, elliptic, obtuse, sub-glabrous. *Staminal-tube* free from the petals, widely tubular, glabrous except a few strong hairs at the throat, the mouth with 6 lanceolate spreading teeth; anthers 6, linear-elongate, about as long as the teeth of the calyx. *Ovary* small, surrounded by a narrow fleshy glabrous disc; *style* cylindric, pubescent; *stigma* small, disc-like with an annulus at its base. *Female flowers* like the males, but usually without anthers; the ovary ovoid-conic, pubescent. *Fruit* obovoid or depressed-globose, tapering at the base into a pseudo-stalk, minutely tomentose, 1·5 in. in diam., 2-celled, seeds about 2. Miq. Fl. Ind. Bat. I, Pt. 2, 537; Ann. Mus. Lugd. Bat. IV. 28; C. De Cand. Mon. Phan. I, 529. *C. fragrans*, Hiern in Hook. fil. Fl. Br. Ind. I, 551; C. De Cand. l. c. 529.

Malacca: Griffith, No. 1062/1 Maingay, (Kew Distrib.) No. 324.

Perak; King's Collector, Nos. 4631, 4795, 6864? Burma: Wall. Cat. 8069.

I have compared the authentic specimens of the Leiden Herbarium of *C. patens*, Blume, with the type specimens at Kew of *C. fragrans*, Hiern; and I find them to agree exactly. I therefore adopt the older name. The male panicles of this are rather longer and wider at the base than the female panicles; but both are pyramidal. I believe the plant issued by Wallich as a *Cupania* (No. 8069 of his Catalogue) may belong to this. The specimens are in fruit only and were originally named by Wallich *Trichelia longissima*.

5. DYSOXYLUM, Blume.

Trees, mostly glabrous. *Leaves* pinnate; leaflets entire, opposite sub-opposite or alternate, more or less acuminate at the apex and oblique at the base, coriaceous. *Flowers* paniculate, racemose or spicate, hermaphrodite. *Calyx* 4- rarely 5-fid, dentate or partite or sub-entire, imbricated, not accrescent. *Petals* 4, rarely 5, oblong, spreading, valvate or slightly imbricated. *Staminal tube* cylindrical, dentate or crenulate at the mouth; *anthers* 6, 8 or 10, short, included or the tips exserted. *Disc* tubular, equal to or twice as long as the ovary, crenulate or entire at the mouth. *Ovary* usually 3- 4-celled; style about equalling the staminal tube; ovules usually 2 in each cell. *Capsule* globose or pear-shaped, coriaceous (often thickly so), 1- 4-celled, loculicidal; seeds arillate or exarillate, exalbuminous.—

DISTRIB. Species about 100, mostly found in the Malay Archipelago, but some in Australasia.

FLOWERS PENTAMEROUS. ... ... 1. *D. arborescens*.
FLOWERS TETRAMEROUS.
Inflorescence paniculate.
Panicles slender, lax, few-flowered.
Leaflets linear-lanceolate; flowers ·6 in. long ... ... 2. *D. angustifolium*.
Leaflets oblong-lanceolate, caudate-acuminate; flowers ·15 in. long ... 3. *D. dumosum*.
Panicles with few branches; the branchlets very short, spicate, distant; the flowers only ·1 in. long, densely crowded ... 4. *D. interruptum*.
Panicles with many divaricating branches, many-flowered.
Leaflets minutely rugulose when dry, their main nerves indistinct ... 5. *D. acutangulum*.

Leaflets not rugulose when dry, their main nerves distinct

Veins of leaflets winged; flowers ·25 in. long ... ... 6. *D. venulosum.*

Veins of leaflets not winged.

Disc hairy, slightly exceeding the sub-strigose ovary; flowers ·15 in. long ... 7. *D. thyrsoideum.*

Disc glabrous, half as long as the style, slightly constricted below the thickened pilose mouth, ovary densely pilose; flowers ·45 in. long 8. *D. turbinatum.*

Disc glabrous, slightly longer than the glabrous ovary; flowers ·2 in. long 9. *D. costulatum.*

Disc glabrous outside, pubescent inside, much longer than the densely adpressed-pubescent ovary; flowers ·5 in. long ... ... 10. *D. macrothyrsum.*

Inflorescence spicate or racemose.

Spikes or racemes from the stem or from the branches below the leaves.

Disc membranous, glabrous, obscurely crenate, longer than the densely pilose narrowly ovoid ovary; flowers ·3 to ·35 in. long; fruit ovoid, apiculate, glabrous ... 11. *D. cauliflorum.*

Disc fleshy, longer than the tomentose-lepidote sub-globular ovary; flowers ·25 in. long; fruit ovoid, rusty-tomentose ... ... 12. *D. Griffithii.*

Disc thinly fleshy, glabrous, crenulate, longer than the depressed sericeous ovary; flowers ·15 in. long; fruit obovoid, apiculate, obscurely 4-angled, tawny-tomentose 13. *D. densiflorum.*

Disc membranous, glabrous outside, pubescent inside, as long as the ovoid-conic sparsely pilose ovary; flowers ·35 in. long; fruit subglobose ... ... 14. *D. cuneatum.*

- Spikes or racemes axillary.
  - Spicate cymes or racemes from 4 to 8 in. long.
    - Disc fleshy, glabrous, crenulate, slightly longer than the hemispheric densely puberulous ovary; flowers ·2 in. long ... ... 15. *D. racemosum.*
    - Disc puberulous, with thickened rugulose pilose mouth, longer than the ovoid-conic pubescent ovary; flowers ·6 in. long ... 16. *D. microbotrys.*
  - Spikes from 2 to 4 in. long.
    - Disc glabrous, longer than the puberulous 4-furrowed ovary; flowers ·35 in. long ... ... 17. *D. flavescens.*
  - Spikes or racemes not more than 2 in. long.
    - Leaves not rugulose when dry.
      - Disc fleshy, annular, crenulate, shorter than the conic pubescent ovary; flowers ·5 in. long ... 18. *D. andamanicum.*
    - Leaves rugulose or papillose.
      - Disc fleshy, glabrous, 8- to 9- toothed, exceeding the hemispheric ridged puberulous ovary; flowers ·2 in. long ... ... 19. *D. rugulosum.*
      - Flower buds globose, ·15 in. in diam.; calyx campanulate; disc none, or very small, ovary broadly ovoid ... ... 20. *D. papillosum.*

1 DYSOXYLUM ARBORESCENS, Miq. in Ann. Mus. Lugd. Bat. IV, 24. A tree 20 to 30 feet high. *Leaves* 6 to 9 in. long, unequally pinnate, glabrous; leaflets 2 to 3 pairs, membranous, opposite or sub-opposite, elliptic (sometimes rather broadly so), slightly obovate, shortly abruptly and obtusely acuminate, the base very cuneate; main nerves 6 to 8 pairs spreading, curving, not prominent on either surface; length 2·5 to ·5 in., breadth 1·25 to 2·25 in., the odd leaflet usually the largest; petiolules slender, ·3 to ·5 in., that of the odd leaflet often 1 in. *Panicles* extra-axillary, solitary, 1·5 to 4 in. long, with a few short lax-flowered divaricating branches. *Flowers* ·25 in. long, on thin pedicels of the same length. *Calyx* a very shallow obscurely toothed cup. *Petals* 5, linear, slightly thickened and narrowed towards the apex, glabrous, longer than the sta-

minal tube. *Staminal tube* widely cylindric, inflated or not at the base, shorter than the style, glabrous, with 10 broad shallow sub-crenate teeth; *anthers* small, ovate, included, or the tips exserted. *Disc* widely tubular, thick, fleshy, sub-crenulate, longer than the ovary. *Ovary* depressed, ovoid-globular, pubescent, 4-celled; *style* cylindric, sparsely pubescent below, glabrous above; *stigma* discoid with a broad projecting annulus at its base. *Fruit* turbinate, with 3 or 4 (sometimes only 2) vertical grooves, glabrous, not narrowed into the stalk, 1·25 in. in diam., 2- to 4- seeded. *Seeds* ovoid, apparently ex-arillate. C. De Cand. Mon. Phan. I, 489, (excl. syn. *D. lampongum*, Miq.). *D. Maingayi*, Hiern in Hook. fil. Fl. Br. Ind. I, 547; C. De Cand. l. c. 490. *Goniocheton arborescens*, Blume Bijdr. 177: Miq. Fl. Ind. Bat. I, pt. 2, p. 540. *Hartigsea acuminata*, Miq. Fl. Ind. Bat. Suppl. 196, 504. *Trichelia arborescens*, Spreng. Syst. Vol. IV, cur. post. p. 252.

Malacca: Maingay (Kew Distrib.) No. 359. Perak: Scortechini, Wray. S. Andaman; King's Collectors. DISTRIB. the Malayan Archipelago.

The flowers of some of the Andamans specimens are 6-merous.

2. DYSOXYLUM ANGUSTIFOLIUM, King n. sp. A glabrous tree; young branches slender, terete. *Leaves* 10 to 12 in. long, equally pinnate; leaflets about 5 pairs, opposite, membranous, linear-lanceolate, the base much narrowed; main nerves 9 to 12 pairs, oblique, little curved, obsolete on the upper, faint on the lower, surface; length 3·5 to 5·5 in., breadth 5 to 6·5 in., petiolules ·25 in. *Panicles* extra-axillary, slender, lax, 1·5 to 4·5 in. long. *Flowers* ·6 in. long, each at the apex of a short minutely bracteolate branchlet. *Calyx* shortly cupular, with 4 triangular teeth, glabrous, fleshy, tapering below into a short fleshy pedicel. *Petals* 4, many times longer than the calyx, linear-oblong, sub-acute, slightly thickened and connivent at the apex, minutely puberulous outside, glabrous inside. *Staminal tube* nearly as long as the petals, cylindric, rather fleshy like the petals, glabrous, very slightly wider at the obscurely 8-toothed apex; anthers 8, elliptic-oblong, included. *Disc* tubular, much longer than the ovary, and one-third of the length of the style, fleshy, glabrous except at the thickened obscurely 8-toothed pubescent mouth. *Ovary* ovoid, 4-angled, puberulous, 4-celled, tapering into the long 4-angled puberulous style; *stigma* slightly exserted, rather small, discoid, with a broad basal annulus. *Fruit* (unripe) obovoid, tapering much at the base, glabrous, about 1 in. long, peduncle 1 in.

Pahang; Ridley, Nos. 2656 and 5840.

The flowers of this have a strongly alliaceous odour.

3. DYSOXYLUM DUMOSUM, King, n. sp. A shrub 3 to 6 feet high.

Leaves 5 to 14 in. long, equally pinnate, the petioles angled and channelled in front; *leaflets* opposite, 2 or 3 rarely 5 pairs, membranous, oblong-lanceolate, shortly and bluntly caudate-acuminate, much narrowed to the base; main nerves 7 or 8 pairs, curved, quite obscure on both surfaces, length 2·5 to 4·5 in. rarely 5 in.; breadth ·75 to 1·45, rarely 1·75 in., petiolules 2 in. *Panicles* shorter than the leaves, extra-axillary, pedunculate, with a few spreading scantily-flowered branches in the upper part, or racemose and branched from the base, 1·5 to 4 in. long. *Flowers* ·15 in. long, on bracteolate pedicels as long as or longer than themselves. *Calyx* cupular, much shorter than the petals, glabrous, with 4 (rarely 5) small teeth. *Petals* 4, slightly unequal, broadly oblong with truncate bases, obtuse, the apex thickened and slightly incurved, glabrous or sub-glabrous. *Staminal tube* shorter than the petals and adherent to their bases, widely cylindric, glabrous, the mouth with 8 broad shallow emarginate teeth; anthers alternate with the teeth, shortly ovate, sub-exserted. *Disc* fleshy in the fertile female flowers, slightly longer than the ovary and lobed; in the fertile male flower shorter and entire. *Ovary* depressed, pilose; *style* cylindric, sparsely pilose below; *stigma* in the fertile female broadly discoid, 5-angled, with an annular disc beneath it, in the fertile male cylindric. *Fruit* depressed-globular, glabrous, ·5 in. in diam., crowned by the base of the style, 4-celled, with 3 or 4 shining black seeds.

Perak: Scortechini, King's Collector. Johore: Ridley, No. 4194.

In habit this resembles *D. arborescens*, from which, however, it is at once distinguished by its equally pinnate leaves and tetramerous flowers.

4. DYSOXYLUM INTERRUPTUM, n. sp. King. A tree 30 to 40 feet high; young branches cinereous-pubescent. *Leaves* 24 to 30 in. long, equally pinnate; leaflets about 10 pairs, membranous, sub-opposite or opposite, oblong to elliptic-oblong, shortly and sharply acuminate, the base cuneate; upper surface glabrous, the nerves and midrib pubescent; lower surface puberulous, the 18 to 24 pairs of straight sub-ascending main nerves rather prominent and with long sparse hairs; length 5 to 7 in., breadth 2·25 to 2·75 in., petiolules ·1 to ·2 in. *Panicles* solitary, slightly supra-axillary, with few spreading branches; the ultimate branchlets very short, distant; the flowers ovoid, densely crowded, sessile, ·1 in. long. *Calyx* cupular, pubescent, with 4 or 5 triangular acute spreading teeth. *Petals* 4, longer than the calyx, erect, valvate, elliptic, sub-acute, the sides straight, pubescent outside, puberulous inside. *Staminal tube* shorter than the petals, cylindric, glabrous, the mouth with 8 rather broad bifid teeth. *Anthers* 8, short, elliptic, included. *Disc* shortly cylindric, longer than the ovary, fleshy, glabrous; its

mouth with 8 obscure broad blunt teeth. *Ovary* depressed and broadly ovoid, pilose, 3-celled; style short, stout: *stigma* thickly discoid with an annulus at its base. *Fruit* unknown.

Perak: King's Collector, No. 6349.

A very distinct species distinguished at once by its small densely crowded flowers in interrupted spicate panicles.

5. DYSOXYLUM ACUTANGULUM, Miq. Fl. Ind. Bat. Suppl. 196, 503; Ann. Mus. Lugd. Bat. IV., 26. A glabrous tree, the young branches rather stout with pale brown striate bark. *Leaves* 6 to 12 in. long, equally pinnate: the rachis and petiole 4-angled: leaflets 3 or 4 pairs, coriaceous, opposite or sub-opposite, unequal-sided especially towards the more or less acute base, elliptic or ovate, or sometimes slightly obovate, the apex acute or shortly acuminate, both surfaces minutely rugulose and of a pale olivaceous colour when dry; main nerves imperceptible; length 2·5 to 4·5 in., breadth 1·25 to 2·2 in., petiolule ·2 to ·25 in. *Panicles* 2·5 to ·4 in. long, spreading, puberulous, *Flowers* rather crowded, ·35 in. long. *Calyx* puberulous, very shallow, with 4 deep reflexed triangular teeth. *Petals* 4, thin, much larger than the calyx, oblong, sub-acute, puberulous on both surfaces. *Staminal tube* a little shorter than the petals, cylindric, the mouth with 8 rather deep sharp teeth, striate, puberulous on both surfaces; *anthers* 8, oblong, rather small, slightly exerted. *Disc* widely tubular, slightly exceeding the ovary, fleshy, its mouth slightly inflexed, obscurely 8-toothed. *Ovary* adpressed-pubescent, broadly ovoid, tapering into the long style: style glabrescent in its upper part, adpressed-pubescent in the lower. *Stigma* exserted, shortly cylindric, with a small annulus at its base. *Fruit* obovoid, 3 in. long; the pericarp very coriaceous, glabrous, pale brown when dry and minutely rugulose, 3-celled. *Seeds* one in a cell, ellipsoid and apparently when fresh embedded in pulp. C. DC. in Mon. Phan. I., 525.

Singapore: Ridley, No. 3828. Perak: Scortechini, No. 1048. DISTRIB. Bangka.

The late Fr. Scortechini collected only a single specimen of this which is in flower, and Mr. Ridley collected it in fruit in Singapore. These specimens agree absolutely in their leaves with a specimen from Bangka now in the Leiden Herbarium on which Miquel founded the species.

Miquel does not describe the flowers, and the specimen lent to me by the Leiden Herbarium has none. In the Leiden Annals, Miquel expresses a doubt whether this plant may not be Aurantiaceous. The flowers (which Miquel had never seen) are however unmistakably Meliaceous, and the leaflets moreover are not pellucid-dotted.

6. DYSOXYLUM VENULOSUM, King, n. sp. A tree 50 to 80 feet high; young branches rather stout, angled, puberulous. *Leaves* 12 to 18 in. long, the petiole and rachis angled and puberulous, equally or unequally pinnate; leaflets 7 to 14, membranous, alternate, oblong, slightly unequal-sided, acuminate, the base much narrowed and oblique; both surfaces glabrous, the 13 to 15 pairs of oblique curving main nerves indistinct on the upper, rather prominent on the lower, the veins on both surfaces prominent and winged when dry; length 5 to 7 in., breadth 1·35 to 1·75 in., petiolules ·25 in. *Panicles* extra-axillary, 6 to 8 in. long, glabrescent; the branches numerous, short, sub-horizontal, few-flowered. *Flowers* ·25 in. long; their pedicels about the same length, jointed at the middle. *Calyx* cupular, with 4 shallow teeth, glabrous. *Petals* 4, much longer than the calyx, densely hairy, puberulous externally, sparsely so internally, oblong, obtuse, the apex slightly thickened and inflexed. *Staminal tube* slightly shorter than the petals, glabrous, cylindric, its mouth irregularly and minutely toothed; anthers 8, oblong, inserted below the mouth of the tube. *Disc* cylindric, fleshy, glabrous, about as long as the ovary, the mouth with 4 broad minutely erose teeth. *Ovary* ovoid, hoary-pubescent, tapering into the long cylindric sub-glabrous style; *stigma* slightly exserted, thickly discoid with an annulus at its base. *Fruit* unknown.

Perak: King's Collector, No. 1036.

7. DYSOXYLUM THYRSOIDEUM, Griff. ex Hook. fil. Fl. Br. Ind. I., 547. A tree; leaves 12 to 16 in. long, their petioles and rachises angled: leaflets about 8, alternate, coriaceous, elliptic-oblong to elliptic, shortly acuminate, slightly narrowed to the oblique base, both surfaces quite glabrous; main nerves 6 to 8 pairs, curved, ascending, slightly depressed in the upper and prominent on the lower surface when dry; length 4·5 to 8·5 in., breadth 1·75 to 3 in., petiolules ·3 in. *Panicles* slightly extra-axillary, pyramidal, with stout rachises less than half the length of the leaves; their main branches divaricating, the ultimate racemose; flowers numerous, 15 in. long, their pedicels nearly as long. *Calyx* one-third of the length of the petals, cupular, coarsely and irregularly 4-toothed, glabrous. *Petals* 4, oblong, obtuse, glabrous. *Staminal tube* shorter than the petals and attached to them, cylindric, glabrous outside, pubescent inside, its mouth with 8 broad sub-crenate teeth; *anthers* short, ovate, included. *Disc* tubular, fleshy, hairy, slightly exceeding the ovary, truncate. *Ovary* narrowly ovoid, sub-strigose, 3-celled; *style* cylindric, thick, as long as the staminal tube; *stigma* exserted, discoid with a basal ring. *Fruit* (fide Hiern) "obovoid, fleshy, 2- 3-lobed, umblicate, nearly 1 in. long; fruiting peduncles woody, stout, seeds ex-arillate." C. DC. in Mon. Phan. I., 481.

Malacca, Griffith, (Kew Distribution) No. 1053. Penang: Curtis, Nos. 2467, 2468. Andamans: King's Collectors.

Var. *Andamanica*: flowers ·25 in. long, calyx very short: panicles sometimes as long as the leaves, lax.

S. Andamans. King's Collectors.

This differs from typical *D. thyrsoideum* chiefly in the points above noted. When better specimens of the typical Malacca form are obtained, characters may be found sufficient to separate the two specifically.

8. DYSOXYLUM TURBINATUM, King n. sp. A small tree 12 to 20 feet high; young branches rather stout, the bark pale brown and striate. *Leaves* 10 to 16 in. long, the petioles and rachises glabrous, terete, equally pinnate; leaflets 2 to 4 pairs, sub-opposite, thinly coriaceous, elliptic to elliptic-oblong, shortly and bluntly acuminate, the base rounded or slightly narrowed, not oblique; both surfaces glabrous, the lower subglauceous, very minutely dotted, the nerves pubescent when young; main nerves 8 to 11 pairs, curved, spreading, very prominent on the lower, slightly depressed on the upper surface; length 3 to 6 or even 8 in., breadth 1·5 to 2·5 in. or even 3·5 in., petiolules ·35 in. *Panicles* supra-axillary, 3 to 11 in. long, puberulous, rather slender, with few distant minutely bracteolate branches each bearing 5 to 10 flowers mostly in its upper half. *Flowers* ·45 in. long. *Calyx* cupular, pubescent, narrowed to a short fleshy pedicel, its mouth with 4 short triangular teeth. *Petals* 4, linear-oblong, thickened and slightly concave at the apex, minutely adpressed-pubescent outside, with a few fleshy hairs inside at the apex, otherwise glabrescent. *Staminal tube* cylindric, slightly shorter than the petals, the mouth with 8 shallow broad truncate teeth, puberulous outside, glabrous inside. *Anthers* oblong, short, included. *Disc* half as long as the style, tubular, slightly constricted below the thickened pilose mouth, otherwise glabrous. *Ovary* narrowly ovoid, densely pilose; style 4-angled, glabrescent; stigma slightly exserted, small, discoid, with a basal annulus. *Fruit* depressed-globular, tapering at the base into a short pseudo-stalk, covered with brownish pale-edged scales, 1·5 in. length (excluding the pseudo-stalk) and slightly more in diameter.

Perak: King's Collector, No. 8751. Johore: Herb. Ridley, No. 4060. Malacca: Griffith.

In the above description the flowers are described from the specimens of Mr. Ridley and of my own collector, and the fruit from a single Griffithian specimen from Malacca which has no flowers, the three being in my opinion identical.

9. DYSOXYLUM COSTULATUM, Miq. in Ann. Mus. Lugd. Bat. Vol. IV.,

21. A glabrous tree 40 to 50 feet high. *Leaves* 9 to 14 in. long; *leaflets* sub-coriaceous, opposite, about 4 pairs, elliptic-oblong or elliptic, cuspidate or shortly acuminate; the base acute, slightly oblique; main nerves 10 to 12 pairs, curved, spreading, stout and prominent on the lower surface; length 3·5 to 6 in., breadth 1·5 to 2·75 in., petiolules about ·3 in. *Panicles* axillary or terminal, about half as long as the leaves or less; their branches divaricating and racemoid, glabrous. *Flowers* not crowded, about ·2 in. long, on short pedicels, bracteolate; pedicels cylindric in bud. *Calyx* a very short obscurely 4-toothed cup. *Petals* 4, oblong, obtuse, minutely puberulous externally. *Staminal tube* free from and nearly as long as the petals, cylindrical, the mouth with 8 broad shallow crenulate teeth, glabrous outside, villous inside. *Anthers* 8, short, ovate, included. *Disc* tubular, glabrous, crenately 4-toothed, longer than and surrounding the ovary. *Ovary* glabrous, narrowly ovoid, tapering into the cylindric style. *Stigma* slightly exserted, discoid with a band round its base. *Fruit* depressed-globular with 3 shallow vertical grooves; tapering at the base into a pseudo-stalk, 1·5 in. or more in diam., 4-celled; the pericarp woody, glabrous. Seeds sub-globular. C. De Cand. in Mon. Phan. I, 503. *D. brevipes*, Hiern in Hook. fil. Fl. Br. Ind. I, 560; C. DC. in Mon. Phan. I, 503. *Hartighsea costulata*, Miq. Fl. Ind. Bat. Suppl. 196, 505.

Malacca: Griffith; Maingay, Nos. 319, 320 (Kew Distrib.); Stolickza, Wray, King's Collector. Pahang: Ridley. Singapore: Ridley. Distrib. Sumatra.

The type specimens of *D. brevipes* Hiern at Kew agree exactly with those of the older *D. costulatum* Miq. in the Royal Herbarium at Leiden.

10. DYSOXYLUM MACROTHYRSUM, Miq. in Ann. Mus. Lugd. Bat. IV., 20. A tree 30 to 60 feet high; young branches rather stout, striate. *Leaves* 11 to 16 in. long, equally pinnate, the petioles and rachises puberulous: *leaflets* thinly coriaceous, 3 or 4 pairs, opposite, oblong-lanceolate to elliptic-oblong or elliptic, shortly acuminate, the base cuneate and slightly oblique; upper surface glabrous except the sometimes puberulous midrib, the lower glabrous: main nerves 8 to 11 pairs, spreading, prominent and almost winged on the lower faintly depressed on the upper surface; length 3 to 5·5 in. or even 7 in., breadth 1·5 to 2·25 in., petiolules ·25 to ·4 in. *Racemes* slightly supra-axillary, slender, puberulous, few-flowered, 4 to 7 in. long. *Flowers* ·5 in. long, distant, on short bracteolate pedicels. *Calyx* a short fleshy rugulose puberulous cup, with 4 broad triangular teeth. *Petals* 4, deflexed, many times longer than the calyx, narrowly oblong, slightly widened at the base; the apex sub-acute, slightly thickened and inflexed, externally with dense pale adpressed hairs, internally glabrescent. *Staminal tube*

shorter than the petals, cylindric, adpressed-pubescent outside, the mouth almost entire or minutely toothed. *Anthers* 8, linear-elliptic, their apices not reaching the mouth of the tube. *Disc* much longer than the ovary, cylindric, glabrous externally, softly pubescent internally especially at the acutely 8-toothed mouth. *Ovary* narrowly ovoid-conic, tapering into the long glabrous cylindric style, 4-angled, densely adpressed-pubescent; stigma exserted, thickly discoid, rugulose, with a narrow annulus at its base. *Fruit* turbinate, with four shallow vertical grooves and four broad rounded angles, sub-glabrous, crowned for a time by the persistent stout short style, when fully ripe white slightly tinged with pink, about 1·25 in, long, and 1·5 in., or more in diam. C. DC. in Mon. Phan. I, 485. *D. Lampongum*, Miq. Fl. Ind. Bat. Suppl. 196, 303 (excl. var. B., fide Miq. Ann. Mus. Lugd. Bat. IV., 20.)

Perak: King's Collector, Nos. 5428, 6738, 10440; Wray, Nos. 2329, 3072. Selangore: Ridley, No. 1892. Distrib. Borneo.

I follow Miquel and M. C. deCandolle in keeping this species up. It is, however, very closely allied to *D. excelsum*, Bl. The panicles of Perak specimens are rather shorter and fewer-flowered than in those collected in Borneo; in other respects they agree.

11. DYSOXYLUM CAULIFLORUM, Hiern in Hook. fil. Fl. Br. Ind. I., 549. A tree 30 to 50 feet high. *Leaves* 1 to 2 feet long, their petioles and rachises deciduously rusty-puberulous, angled, unequally pinnate; leaflets 9 to 13, membranous, opposite or alternate, oblong-elliptic or elliptic, shortly acuminate, the base cuneate or rounded at one side and obliquely cut away at the other; both surfaces glabrous except the pubescent midrib; main nerves 8 to 13 pairs, spreading, rather prominent on the lower surface; length 4 to 7 in. occasionally 12 in., breadth 1·75 to 2·75 in., petiolules ·2 to ·3 in. *Spikes* from 1 to 3 in. long, tawny-tomentose, in dense clusters on rugose woody tubercles from the stem. *Flowers* ·3 to ·35 in. long, their pedicels about ·1 in., bracteolate at the base. *Calyx* cupular, with 3 or 4 broad irregular teeth, pubescent. *Petals* 4, oblong, obtuse, glabrous inside, glabrous or puberulous outside, free from the staminal tube. *Staminal tube* cylindric, glabrescent or sparsely sericeous outside, sericeous inside, the mouth with 8 broad shallow bifid teeth; *anthers* 8, ovate, included. *Disc* tubular, membranous, longer than the ovary, glabrous, the mouth obscurely crenate. *Ovary* narrowly ovoid, densely pilose; the style cylindric, sparsely pilose in the lower, glabrous in the upper half. *Stigma* slightly exserted, broadly discoid with a narrow annulus at its base. *Fruit* ovoid, apiculate, tapering slightly at the base, substriate, glabrous, red-coloured, splitting into 4 valves. *Seeds* sub-globular, plano-convex, ·5 in. long. C. DC. in Mon. Phan. I., 498.

Malacca: Griffith, Maingay, No. 327 (Kew Distrib.). Singapore; Anderson, Hullet. Perak: Scortechini, Wray, King's Collector.

12. DYSOXYLUM GRIFFITHII, Hiern in Hook. fil. Fl. Br. Ind. I., 549. A tree. *Leaves* 12 to 18 in.; leaflets 9 to 13, membranous, alternate, oblong-lanceolate, acuminate, the base cuneate, glabrous, shining, (olivaceous when dry); main nerves numerous, spreading, indistinct on both surfaces, the midrib thin but slightly prominent on the lower; length 3 to 5 in., breadth 1 to 1·5 in., petiolules ·1 in., *Racemes* from the axils of fallen leaves, ·5 to 1·5 in. long, stout, minutely bracteolate. *Flowers* ·25 in. long, their pedicels less than ·1 in. *Calyx* nearly flat, very short. *Petals* 4, oblong, obtuse, puberulous outside. *Staminal tube* slightly shorter than the petals, cylindric; its mouth with 8 broad shallow sub-emarginate teeth, puberulous outside; anthers 8, ovate, their tips exserted. *Disc* shortly cylindric, crenulate, fleshy, longer than the ovary. *Ovary* sub-globular, 4-angled, minutely tomentose-lepidote, 3- to 4-celled. *Style* as long as the staminal tube, 4-angled, puberulous: *stigma* discoid with an annulus at its base. *Fruit* unknown. C. DC. in Mon. Phan. I., 497. *Hartighsea ramiflora*, Griff. Notulæ IV., 501.

Malacca, Griffith.

This does not appear to have been collected since Griffith originally found it (1845) at Malacca. It is a very well-marked species, and Griffith's original description of it is, in all respects except that of fruit, full and clear.

13. DYSOXYLUM DENSIFLORUM, Miq. in Ann. Mus. Lugd. Bat. IV, 9. A tree 20 to 40 feet high. *Leaves* unequally pinnate, 15 to 20 in. long, their petioles and rachises angular, deciduously puberulous. *Leaflets* 11 to 13, opposite or alternate; the terminal larger than the others; more or less obovate and with a longer petiolule; lateral leaflets elliptic or elliptic-oblong, slightly oblique, acute or shortly acuminate, the base rounded or sub-cuneate and unequal, both surfaces glabrous; main nerves 10 to 12 pairs, spreading, curved, slightly prominent beneath; length 4·5 to 7 in., the terminal 1 or 2 in. longer; breadth 2 to 2·5 in., the terminal sometimes 3 in.; petiolules ·15 in., the terminal ·75 to 1 in. *Spikes* in clusters from woody tubercles on the stem, 1 to 2 in. long, tawny-tomentose. *Flowers* (in bud only), about ·15 in. long, sub-globular, their pedicels slightly shorter with bracteole at the base. *Calyx* almost as long as the petals, campanulate, coarsely pubescent, its mouth with 4 large irregular teeth. *Petals* 4, free, slightly imbricate, sub-orbicular (in bud), the apex slightly inflexed. *Staminal-tube* nearly as long as the petals, glabrous, widely tubular, divided almost to the base into 8 broad sub-truncate erose teeth; *anthers*

8, included, elongate-elliptic, alternate with the lobes. *Disc* cylindric, short but longer than the ovary, thinly fleshy, crenulate, glabrous. *Ovary* depressed, 4-celled, sericeous as is the base of the short stout style; *stigma* slightly exserted, discoid. *Fruit* (young) narrowly obovoid, shortly apiculate, narrowed at the base into a pseudo-stalk, obscurely 4-angled, densely but minutely tawny-tomentose, 1·5 in. long, including the pseudo-stalk. C. DC. Monog. Phan. I, 499. *Epicharis densiflora*, Blume Bijdr. 167; Miq. Flor. Ind. Bat. Vol. I, pt. 2, p. 539. *Epicharis altissima*, Blume *ex* Miq. l.c. *Guarea densiflora*, Spreng., Syst. IV, 251.

Perak: King's Collector, Nos. 4934, 8826, 10093 and 10443. Wray No. 437. Scortechini, No. 1661. DISTRIB. Java, Sumatra.

In the youngest stages the fruit is ovoid: as it ripens it becomes obovoid and the base becomes narrowed into a pseudo-stalk.

14. DYSOXYLUM CUNEATUM, Hiern in Hook. fil. Fl. Br. Ind. I, 551. A large tree. *Leaves* 18 to 30 in. long, unequally pinnate; leaflets about 13, sub-coriaceous, opposite or sub-opposite, elliptic-oblong, shortly cuspidate; the base cuneate, unequal-sided; both surfaces glabrous, the lower punctate; main nerves 14 to 17 pairs, spreading, slightly prominent beneath when dry; length 4 to 7 in., breadth 2 to 3 in.; petiolules ·15 in., stout, that of the terminal leaflet ·75 in. *Spikes* cinereous-tomentose, only a few inches long in flower, but elongating much in fruit, (from the branches below the leaves?) clustered. *Flowers* ·35 in. long, sub-sessile, bracteolate. *Calyx* half as long as the petals, campanulate, with 4 obtuse irregular deep teeth, pubescent. *Petals* 4, oblong, sub-imbricate, sub-glabrous *Staminal-tube* longer than the petals, glabrescent outside, villous inside, the mouth with 8 obtuse shallow teeth. *Anthers* 8, shortly ovate, included. *Disc* membranous, tubular, about as long as the ovary, glabrous outside, pubescent inside, its mouth minutely crenulate. *Ovary* ovoid-conic, pilose; style cylindric, sparsely pilose in the lower part, glabrous above, *stigma* discoid with an annulus at its base. *Fruiting-spike* half as long as the leaves: ripe fruit sub-globose, about 1 in. in diam., sub-glabrous, the pericarp splitting into about 4 valves; seeds oblong, plano-convex, ·75 in. long, C. DC. in Mon. Phan. I, 496.

Malacca: Maingay (Kew DISTRIB.), No. 322-2.

Known only by Maingay's scanty specimens; allied to *D. cauliflorum* in inflorescence flowers and fruit.

15. DYSOXYLUM RACEMOSUM, King n. sp. A shrub, all parts glabrous except the young shoots and the inflorescence. *Leaves* 12 to 18 in. long, equally pinnate. *Leaflets* membranous, alternate, elliptic-oblong, the apex shortly acuminate, the base broad, slightly unequal; main nerves 8 to 10 pairs, curving, spreading, slightly prominent beneath,

length 5 to 8 in., breadth 2·25 to 3 in., petiolules ·25 in. *Racemes* slightly supra-axillary, solitary, 4 to 5 in. long, puberulous. *Flowers* scattered, ·2 in. long, on slightly shorter thick bracteolate pedicels. *Calyx* a shallow puberulous cup with 4 obscure shallow lobes. *Petals* 4, much longer than the calyx, elliptic, slightly oblique, the apices slightly concave and thickened, the bases truncate, puberulous on both surfaces. *Staminal-tube* slightly shorter than the petals and style, widely cylindric, sparsely puberulous, the mouth with 8 broad 3-toothed lobes. *Anthers* shortly ovate, their apices exserted. *Disc* slightly longer than the ovary, shortly cylindric, fleshy, glabrous, crenulate. *Ovary* hemispheric, densely puberulous, tapering into the thick style. *Stigma* subcapitate, with an annular disc at its base. *Fruit* ovoid, deciduously rusty-puberulous with round smooth pits, the pericarp leathery; length 1·5 to 2 in., diam., ·9 to 1·35 in.

S. Andaman and Nicobar Islands; King's Collectors.

This bears, especially in its inflorsescence, a resemblance to *D. grande*, Hiern; but this is quite glabrous, while that has leaves very pubescent beneath; the fruit also is different.

Var. *arborea*; 20 feet or more in height, leaves up to 20 in. long, leaflets often much narrowed to the base, longer and with more nerves; spikes often 12 in. long.

16. DYSOXYLUM MICROBOTRYS, King n. sp. A tree 40 to 60 feet high. *Leaves* 12 to 20 in. long, equally pinnate, their petioles and rachises glabrescent or glabrous; leaflets thinly coriaceous, opposite, about 3 pairs, elliptic or elliptic-oblong, broadly cuspidate, the base cuneate, both surfaces glabrous; main nerves 9 to 11 pairs, oblique, rather straight, slightly prominent beneath when dry; length 6 to 10 in., breadth 2·5 to 3·5 in., petiolules ·25 to ·35 in. *Cymes* spike-like, solitary, extra-axillary, 4 to 8 in. long, few-flowered. *Flowers* ·6 in. long, usually solitary, on pedicels ·15 in. long, bracteolate at the base. *Calyx* a shallow slightly 4-toothed puberulous rugulose cup. *Petals* 4, puberulous, oblong, slightly widened at the base; the apex sub-acute, thickened and incurved. *Staminal-tube* slightly shorter than the petals and style, everywhere puberulous; its mouth not expanded but with many broad shallow obscure teeth. *Anthers* 8, narrowly elliptic, inserted about their own length below the mouth. *Disc* longer than the ovary, tubular, puberulous; the mouth thickened, rugulose, pilose. *Ovary* ovoid-conic, pubescent; *style* 4-angled, pubescent in its lower, glabrous in its upper, half; *stigma* discoid, with a narrrow annular band at its base, 4-celled, each cell with 2 ovules *Fruit* pyriform, the top often much flattened, 1·5 to 2 in. long, and from 1·25 to 15 in. in diam., sub-glabrous, the pericarp rather thick. *Seeds* about ·75 in. long, plano-convex.

Perak: King's Collector, Nos. 10551, 10580, and probably also No. 10181.

17. DYSOXYLUM FLAVESCENS, Hiern in Hook. fil. Fl. Br. Ind. I, 549. A tree. *Leaves* 1 to 2 feet long; leaflets 9 to 13, membranous, alternate, elliptic, oblique, shortly acuminate, glabrous; the base slightly oblique, rounded; main nerves numerous, sub-horizontal, very indistinct on both surfaces, the midrib prominent especially on the lower; length 3 to 5 in., breadth 1·25 to 2 in., petiolules ·2 to ·25 in. *Spikes* axillary, 2 to 4 in. long. *Flowers* crowded, ·35 in. long, sub-sessile, 4-merous, puberulous. *Calyx* very short, nearly flat, 4-toothed, roughly puberulous. *Petals* 4, minutely pilose outside, glabrous inside, slightly imbricated, pale yellow. *Staminal-tube* glabrous below, slightly pilose above, its mouth crenate. *Anthers* 8 or 10, ovate, included. *Disc* glabrous, exceeding the ovary, dull reddish-orange, its mouth entire or undulate. *Ovary* minutely 4-furrowed, hairy, 4-celled; style cylindrical, hairy; *stigma* discoid. C. DC. in Mon. Phan. I, 494.

Malacca: Maingay (Kew Distrib.), No. 321.

This is known only by Maingay's scanty and incomplete specimens. The preceding description is largely taken from Maingay and Hiern.

18. DYSOXYLUM ANDAMANICUM, King n. sp. A tree 20 to 30 feet high. *Leaves* 6 to 10 in. long, unequally pinnate, the petiole and rachises angled, very pale when dry; leaflets 3 to 5, membranous, alternate, oblong to ovate, slightly oblique, shortly and bluntly acuminate, the base cuneate or rounded, both surfaces glabrous; main nerves 6 to 10 pairs, spreading: length 3 to 5 in., breadth 1·35 to 1·75 in., petiolules ·25 in. *Spikes* slightly supra-axillary, 1 to 2 in. long, few-flowered, puberulous. *Flowers* ·35 in. long, their pedicels about 2 in., puberulous. *Calyx* a shallow minutely 4-toothed glabrous cup. *Petals* 4, much longer than the calyx and slightly imbricate, oblong, sub-acute, convex at the apex, pale puberulous especially externally, reflexed, rarely deciduous. *Staminal tube* shorter than the petals, widely cylindric, slightly inflated near the base, slightly puberulous, the mouth with 9 or 10 broad erose teeth. *Stamens* 8 to 10, alternate with the teeth; *anthers* shortly ovate, slightly exserted. *Disc* fleshy, annular, crenulate, shorter than and adherent to the ovary at its base. *Ovary* conic, densely white pubescent, tapering into the stout style; *stigma* included, discoid with a small annulus at its base. *Fruit* depressed-globular, obscurely 3-grooved, glabrous, the pericarp thickly coriaceous, 1·25 in. in diam. *Seeds* 2 or 3, elliptic.

South Andaman: King's Collector.

19. DYSOXYLUM RUGULOSUM, King n. sp. A tree 15 to 25 feet high:

young branches with striate pale brown bark. *Leaves* 8 to 12 in. long, equally pinnate, the petiole and rachis shorter than the uppermost pair of leaflets; leaflets 2 pairs, the upper pair much the larger, opposite, thickly membranous, pale and minutely rugulose when dry, oblong-oblanceolate, shortly and abruptly acuminate, the base much narrowed; main nerves 8 to 14 pairs, spreading or ascending, faint on the upper surface, prominent and almost winged on the lower: length of the lower pair 3·5 to 4·5 in., breadth about 1·5 in., length of the upper pair 6 to 8 in., breadth about 2·25 in.; petiolules about ·15 in., stout. *Racemes* supra-axillary, ·5 to ·75 in. long, 3- or 4-flowered, puberulous. *Flowers* ·2 in. long, their pedicels shorter. *Calyx* almost flat, 4-cornered, rugulose outside and puberulous, inside glabrous and reticulate. *Petals* 4, much longer than the calyx, elliptic, puberulous outside, glabrous inside, the apex sub-acute slightly thickened and inflexed, the base truncate. *Staminal tube* shorter than the petals, cylindric, slightly ridged and puberulous outside, glabrous inside, the mouth with 8 or 9 broad shallow emarginate teeth; *anthers* elliptic, not exserted. *Disc* shortly cylindric, slightly exceeding the ovary, fleshy, glabrous 8-or 9-toothed. *Ovary* hemispheric, ridged, puberulous, tapering into the long cylindric puberulous style; *stigma* exserted, discoid, with a broad annulus at its base. *Fruit* on a short stout pedicel, pyriform, apiculate, with numerous vertical rugae, puberulous, 1·25 in. long, and ·8 in. in diam. at the broadest part.

Perak: King's Collector, Nos. 2863, 3158, Scortechini.

This resembles *D. macrocarpum*, Bl. in its leaves, but its flowers are much smaller and are in short racemes, not in panicles.

20. DYSOXYLUM PAPILLOSUM, King n. sp. A shrub 6 to 8 feet high; young branches rather stout, densely tawny-tomentose. *Leaves* 12 to 18 in. long, equally pinnate, their petioles and rachises tomentose, more or less angled; leaflets 2 or 3 pairs, the upper pair the largest, opposite or sub-opposite, coriaceous, broadly oblanceolate, shortly acuminate, tapering from above the middle to the very narrow base; both surfaces when dry minutely papillose, many of the papillae and especially those on the upper surface with perforated apices; the upper surface glabrous, olivaceous green when dry; the lower yellowish-brown, the main nerves and midrib pubescent; main nerves 10 to 15 pairs, prominent on the lower, depressed on the upper surface when dry; length 6 to 12 in., breadth 2·25 to ·5 in., petiolules only ·15 in., stout, tomentose. *Spikes* extra-axillary, ·75 to 1·25 in. long, the rachis stout, woody, tomentose. *Flower-buds* globose, ·15 in. in diam., on very short thick pedicels. *Calyx* campanulate, enveloping the petals, 4-toothed, membranous, densely tomentose externally. *Petals* 4, fleshy, broadly

ovate, with truncate bases and sub-acute apices, concave, densely adpressed-pubescent outside, glabrous inside. *Staminal tube* much shorter than the petals, cylindric, rather fleshy, glabrous, the mouth with 8 broad shallow emarginate teeth: *anthers* 8, oblong, longer than the tube, much exserted. *Disc* (if any) very small. *Ovary* broadly ovoid, tapering into the short thick style which is sparsely pilose towards the base: *stigma* thick, discoid, depressed in the centre. *Fruit* unknown.

Perak: King's Collector, No. 10755.

The disc in this plant, if present at all, must be very small, for I cannot detect it in the bud. In spite of this I refer it to *Dysoxylum*, of which it has the general facies. The shrubby habit, short thick spicate inflorescence, globular flower-buds, and the occasionally perforated leaves make this a remarkable and easily recognisable plant.

6. AMOORA, Roxb.

Trees. *Leaves* usually unequally-pinnate; leaflets oblique, quite entire. Flowers in axillary subdiœcious panicles, the females sometimes spicate or racemose. *Calyx* 3- 5-partite or -fid. *Petals* 3, thick, concave, imbricated. *Staminal tube* sub-globose or campanulate, entire or inconspicuously 6–10-crenate; anthers 3–10, included. *Disc* obsolete. *Ovary* sessile, short, 3-celled; cells 1-2-ovuled, stigma sessile. *Capsule* sub-globose, coriaceous, 3-celled and -seeded, loculicidally 3-valved, or indehiscent. *Seeds* in a fleshy aril, with ventral hile.—DISTRIB. A genus of about 25 species occurring only in India and the Malay Archipelago, and also 1 endemic species in Australia.

The Indian species of *Amoora*, as this genus is understood by the most recent botanical writers, fall into two groups. One of these (the old genus *Aphanamixis*) is a very natural one. In this group the male flowers are in panicles with divergent racemose or spicate branches, while the female flowers are in short racemes. The flowers of both sexes have a 5-merous calyx, and a 3-merous corolla, 3 or 6 stamens, 3-celled ovaries and 3-celled loculicidally dehiscent capsular fruits. The other group, named *Pseudo-Aglaia* by M. C. de Candolle, consists of a number of species with from 6 to 10 stamens, 3-celled-ovaries, and large stigmas. Some of these have 3 petals, others have 4 or 5. As regards fruit some of them (*e.g.*, *A. cucullata*) have a 3-celled capsule like that of *Aphanamixis*: others have fruits which show no evidence of dehiscence. In treating this genus, I have excluded all the species having more than 3 petals, and I have abandoned dehiscence in the fruit as a diagnostic character. In the note under the genus *Aglaia*, I have explained the change which I have made in the staminal character of that genus. I may here add that *Amoora Chittagonga*, Hiern, is certainly an *Aglaia*; and that *Amoora decandra* Hiern, with its 10 anthers in two rows, and 5-celled ovary and fruit, is more of a *Lansium* than an *Amoora*.

Section I. Male flowers in panicles, female flowers in short spikes or racemes, sepals 5, petals 3; fruit 3-celled, capsular, loculicidal.

Stamens 3 ... ... 1. *A. Sumatrana.*
Stamens 6 ... ...
  Male flowers ·15 in. long ... ... 2. *A. Rohituka.*
  Male flowers ·3 in. long ... ... 3. *A. Aphanamixis.*

Section II. Male and perfect female flowers mixed in the same panicles: calyx cupular, 3-toothed, petals 3, anthers 6 or 10; *fruit* 3-celled, but not in all cases dehiscent.

Stamens 6 ... ...
  Leaflets cordate and slightly oblique at the base, minutely rusty-tomentose beneath: flowers ·25 in. long ... 4. *A. rubiginosa.*
  Leaflets sub-cuneate at the base, minutely puberulous and lepidote beneath; flowers less than ·1 in. long ... 5. *A. lanceolata.*
  Leaflets sub-falcate and very oblique at the base, everywhere glabrous; flowers ·15 in. long, obovoid ... ... 6. *A. cucullata.*
  Leaflets caudate-acuminate, the base rounded or cuneate, oblique, everywhere glabrous: flowers ·2 in. long, staminal tube cylindiric ... ... 7. *A. Ridleyi.*
Stamens 10 ... ...
  Panicles 12 to 20 in. long, cinereous-scurfy; leaflets with broad bases; flowers ·15 in. long ... ... 8. *A. Wallichii.*
  Panicles 8 to 10 in. long, rusty-puberulous; leaflets narrowed at the base; flowers ·1 in. long ... ... 9. *A. rubescens.*

1. **AMOORA SUMATRANA**, Miq. in Ann. Mus. Lugd. Bat. IV, 35. A tree 12 to 20 feet high; young branches stout, lenticellate, glabrous. *Leaves* 20 to 30 in. long, glabrous, unequally pinnate; leaflets 9 to 13, elliptic to elliptic-oblong, or oblanceolate-oblong, sub-coriaceous, shortly cuspidate, entire, the base more or less cuneate: main nerves 9 to 20 pairs, spreading; length 3 to 10 in., breadth 1·5 to 3·75 in. *Male flowers* ·15 in. long, obovoid, in solitary extra-axillary panicles nearly as long as the leaves, their branches 1·5 to 6 in. long, spreading or drooping: the flowers numerous but not crowded, each with a minute acuminate bracteole, the pedicels half as long as the flower, rather stout. *Sepals* 5, unequal, the two larger nearly half as long as the petals, rotund, the edges erose-fimbriate, the inner surface glabrous, the outer pubescent.

Petals 3, thick, rotund, very concave and much imbricate, glabrous inside, sometimes puberulous outside. *Staminal column* fleshy, globular-ovoid, obscurely 3-angled, the mouth almost closed; anthers 3, broadly elliptic, narrowed to the apex, shortly apiculate; rudimentary ovary minute, conical, on a small pubescent disc. *Female flowers* unknown; the fruit in simple spikes as long as or longer than the leaves, pinkish when ripe, shortly pedicellate, sub-globular, 3-celled, 3-seeded, dehiscent, about ·75 in. in diam.; the *seeds* ovoid, compressed, with a scarlet arillus. C. DC. Monogr. Phaner. I., 581.

Perak: Scortechini, Wray, King's Collector. Penang: Curtis, King. Distrib. Sumatra.

This species resembles *A. Rohituka*, W. and A., but it is a smaller tree, the male flowers have only 3 stamens, and the petals are pink. The Perak specimens agree with those in the Leiden Herbarium from Sumatra on which Miquel founded the species. Miquel in his description does not mention that the plant is triandrous,—a character by which it can at once be recognised.

2. AMOORA ROHITUKA, W. and A. Prod. 119. A tree from 30 to 70 feet high; young branches stout, lenticellate, at first puberulous, afterwards glabrous. *Leaves* 1 to 3 feet long, unequally pinnate, the petioles puberulous; leaflets 9 to 15, sub-coriaceous, opposite, oblong to elliptic-oblong, shortly and bluntly acuminate, entire; the base narrowed, often oblique; both surfaces glabrous: main nerves 12 to 15 pairs, spreading; length 3 to 9 in., breadth 1·75 to 3·5 in., petiolule ·2 to ·3 in. *Male flowers* about ·15 in. long, sub-globular, in solitary axillary panicles more than half as long as the leaves, the branches about 3 in. long, spreading at right angles or slightly drooping; the flowers numerous, each with a minute scale-like bract, the pedicels short, stout. *Calyx* very short, spreading, with 5 or 6 small reniform sepals, pubescent. *Petals* 3, much larger than the calyx, orbicular, concave, glabrous or puberulous on the outer surface. *Staminal tube* nearly as long as the petals, sub-globular, with a small opening at the apex showing the slightly protruding apices of the anthers: *anthers* 6, sub-sessile, narrowly elliptic, attached to the tube near its base; rudimentary ovary ellipsoid, boldly 3-angled. *Female flowers* larger than the males, in axillary or slightly supra-axillary, solitary, often puberulous spikes much shorter than the leaves. *Sepals* sometimes more pubescent than in the male: petals as in the male, the anthers narrower. *Ovary* sub-globular or ellipsoid with a 3-lobed stigma: disc hypogynous, broadly conical, tawny-pubescent. *Fruit* sub-globular, yellow when ripe, 1 to 1·5 in. in diam.; the pericarp coriaceous, smooth, 3-celled, opening by 3 valves: *seed* oblong with a scarlet arillus. Hiern in Hook. fil. Fl.

teeth. *Petals* 3, longer than the calyx, glabrous, broadly elliptic, the apex blunt and concave. *Staminal tube* shorter than the petals, obovoid, its mouth with 6 shallow broad blunt erose teeth; *anthers* 6, elliptic, included, attached half-way up the tube; *rudimentary ovary* broadly ovoid, sub-truncate. *Female flowers* a little larger than the males, but in few-flowered supra-axillary racemes about 2 in. long; *Calyx*, corolla, staminal tube and anthers as in the male; ovary ovate, 3-angled, lepidote, 3-celled: stigma sessile, large, 3-lobed. *Fruit* depressed-globular, 2·5 in. in diam., dehiscing by 3 valves, the pericarp leathery. *Seeds* 3, rounded trigonous, with an orange-coloured arillus. Kurz For. Flora Burma I, 221; C. DC. Monogr. Phan. I, 583; Hiern in Hook. fil. Fl. Br. Ind. I, 560: Bedd. Fl. Sylv. 55; Miq. Ann. Mus. Lugd. Bat. IV, 37; Dalz. and Gibs. Fl. Bomb. 37. *Andersonia cucullata*, Roxb. Hort. Beng. 82; Fl. Ind. II, 212. *Sphaerosacme Rohituka*, Wall. Cat. 1278. *Amoora auriculata*, Miq. MSS.

Perak: Scortechini. Singapore: Ridley. Distrib. Borneo, Korthals: Burma, Khasia Hills, Delta of Ganges, Nepal.

7. Amoora Ridleyi, King n. sp. A tree 50 to 60 feet high; young branches stout, minutely cinereous-puberulous. *Leaves* 18 to 24 in. long, unequally pinnate; leaflets 11 to 17, sub-opposite or opposite, sub-coriaceous, oblong-lanceolate to ovate-lanceolate, caudate-acuminate; the base rounded or cuneate, very unequal; both surfaces glabrous, the lower sub-glaucous; main nerves 8 to 13 pairs, spreading, slightly prominent on the lower surface: length 3·5 to 6 in., breadth 1·35 to 2 in., petiolules ·25 to ·4 in. *Panicles* axillary, solitary, about half as long as the leaves, stellate-pubescent, on long peduncles, much branched, the ultimate branchlets cymulose. *Flowers* ·2 in. long, narrowly ovoid, on bracteolate pedicels nearly as long as themselves. *Calyx* rather deeply cupular, tomentose outside, the mouth with 3 shallow broad teeth. *Petals* 3, longer than the calyx, fleshy, broadly elliptic, with very concave blunt apices, pubescent in the lower half outside, otherwise glabrous. *Staminal tube* much shorter than the *petals*, glabrous outside, with a few scattered hairs inside, cylindric, with a wide mouth with 6 broad shallow teeth; *anthers* 6, narrowly elliptic, their apices exserted; *ovary* depressed, densely pubescent, 3-celled; *stigma* glabrous, large, pyramidal, deeply grooved. *Fruit* globular, minutely rusty-tomentose, 2·5 in. in diam. when ripe, indehiscent, usually with 2 seeds 1·75 in. in length; peduncle, stout, ·5 in. long.

Perak: King's Collector, Nos. 5383, 5918, 6060, 7917; Wray, No. 2107. Pahang: Ridley, No. 5027.

8. Amoora Wallichii, King. A tree: young branches stout, minutely rusty-puberulous. *Leaves* 15 to 24 in. long, unequally pinnate:

leaflets 11 to 13, sub-coriaceous, opposite or sub-opposite, narrowly oblong, sub-acute, the base rounded or slightly cuneate, slightly oblique; both surfaces glabrous: main nerves 16 to 18 pairs, prominent on the rather pale under surface: length 4·5 to 8 in., breadth 1·4 to 2 in., petiolule ·5 in. *Panicles* solitary, axillary, nearly as long as the leaves, with few rather distant lax alternate branches, the ultimate branchlets cymulose and slightly scurfy. *Flowers* ·15 in. long, sub-rotund. *Calyx* a flattish cup with 3 broad shallow teeth, minutely tomentose externally. *Petals* 3, longer than the calyx, rotund, concave, much imbricate, minutely pubescent outside. *Staminal tube* spherical-obovoid, with 10 small acute teeth, glabrous; anthers 10, narrowly elliptic, their apices slightly exserted: rudimentary ovary depressed, tawny-pubescent, crowned by the thick fleshy 3-grooved stigma. *Female flowers* mixed with the males and exactly like them, but with a pyramidal, prominently 3-angled, tawny-pubescent, 3-celled ovary crowned by a stigma as in the male. *Fruit* obovoid, about 2 in. in diam., on a stout peduncle, its surface tawny-tomentose. *Sphaerosacme spectabilis*, Wall. MSS. in Herb. Calc. *Amoora spectabilis* Hiern (not of Miquel) in Hook. fil. Fl. Br. Ind. I, 561. Kurz For. Flora Burma I, 221.

Andaman Islands, King's Collectors. Distrib. Burma, Assam, Sikhim.

There has been some comfusion in dealing with this plant. The description above given is that of Wallich's own specimen (in flower) taken from a tree grown in the Bot. Gard., Calcutta, which had originally been brought from Goalpara in Assam. Fruiting specimens have in more recent years been collected in Assam by Mr. Gustav Mann, for many years Conservator of Forests in that province. Flowering specimens exactly agreeing with Wallich's have also been brought from the Andaman Islands. Miquel has described (Ann. Mus. Lugd. Bat. IV, 37) under the name *Amoora spectabilis*, a plant of which he says *Sphaerosacme spectabilis*, Wall. is the type. But Miquel's description does not fit Wallich's plant at all. Mr. Hiern, taking Miquel's name *A. spectabilis*, describes under it a plant from Burmah which is certainly not Miquel's plant: but which may be the same as *Sphaerosacme spectabilis*, Wall.

9. AMOORA RUBESCENS, Hiern in Hook. fil. Fl. Br. Ind. I, 561. A tree 30 to 40 feet high; young branches stout, rusty puberulous. *Leaves* 18 to 30 in. long: leaflets 13 to 15, opposite, thinly coriaceous, oblong, sub-acute or obtuse, narrowed and oblique at the base, both surfaces glabrous; main nerves 8 to 10 pairs, ascending, rather prominent beneath; length 4 to 5·5 in., breadth 1·75 to 2·25 in., petiolule ·5 in. *Panicles* solitary, axillary, 8 to 10 in. long, rusty puberulous, the

branches spreading, the ultimate branchlets 2- to 3-flowered. *Flowers* on short pedicels, obovoid-rotund, ·1 in. long. *Calyx* cupular, puberulous outside, with 3 broad blunt teeth. *Petals* 3, longer than the calyx, rotund, concave, slightly puberulous on the back and edges. *Staminal tube* broadly ovoid, the mouth wide and with 9 broad bifid teeth; *anthers* 10, elliptic, their apices exserted. *Ovary* depressed, tawny-pubescent, 3-celled: stigma large, cylindric, glabrous, sulcate. *Fruit* depressed-globular, mammillate, 2 in. in diam., minutely rusty puberulous, 3-celled (one cell abortive), pericarp thickly coriaceous, almost fleshy. C. DC. Monog. Phan. I, 589.

Singapore: Maingay Herb. prop. No. 3351 (Kew Distrib. No. 355). Perak: King's Collector, No. 5944; Wray, No. 2349. Penang: Curtis No. 2437.

The fruit when ripe is reddish-brown, according to Mr. Curtis.

7. AGLAIA, Lour.

Trees or shrubs, glabrous, lepidote or stellately pubescent. *Leaves* pinnate or trifoliolate; leaflets quite entire. *Flowers* polygamo-diœcious, minute or small, numerous, paniculate, sub-globose. *Calyx* 5-lobed, imbricated in bud. *Petals* 5, concave, short, imbricated. *Staminal tube* urceolate or sub-globose, 5-toothed at the apex or entire; anthers usually 5, or 4 or 10, included or half-exserted, erect. *Disk* inconspicuous. *Ovary* ovoid or shortly so, 1–3-celled, with 2–1 ovules in each cell; style glabrous, short. *Berry* dry, 1- 2-celled and-seeded. *Seeds* with a fleshy integument.—DISTRIB. Species about 70, Chinese, Indo-Malayan or Polynesian.

The genus *Aglaia* is distinguished by its small flowers with 5-merous calyx and corolla, and depressed-globose or globose staminal tube. The calyx-lobes are often imbricate, and the petals are invariably so, three being outside or partly so, and two entirely covered by the outer three. To the genus, as limited by M. C. de Candolle and Mr. Hiern, only species of which the anthers are either 5 or 6 can be admitted. The effect of this limitation as to the number of the anthers is to force into *Amoora* various species which, taking the section *Aphanamixis* as the type of *Amoora*, have far less in common with that genus than with the 5-antherous species of *Aglaia*. The result, as regards *Amoora*, is that that genus is loaded with a number of anomalous species collected together in a group under the sectional name *Pseudo-Aglaia*. By relaxing the definition of *Aglaia* so as to admit plants of which the flowers have 4, 8 or 10 stamens, and by limiting *Amoora* to plants with 3-merous corollas, it appears to me that both genera are greatly simplified. Dehiscence in the fruit cannot be regarded as a diagnostic character of *Amoora*, there being several Indian species in the fruit of which there is no evidence of dehiscence; but indehiscence in the fruit is an absolute character in *Aglaia*. The effect of the change which I have ventured to carry into effect in the diagnoses of these two genera is, as regards the species described by Mr. Hiern in the Flora of British

India, to convert *Amoora Maingayi* Hiern into an *Aglaia*: *Amoora dysoxyloides*, Kurz is also removed to this genus.

STAMENS 4 ... ... 1. *A. fusca.*

STAMENS 5

Leaves quite glabrous, and not lepidote on the lower surface.

Leaves trifoliolate, 2·5 to 3 in. long, often shorter than the panicles; calyx with elliptic lobes: anthers elliptic, included... 2. *A. odorata.*

Leaves 3- to 5-foliolate, 5 to 9 in. long, always longer than the panicles; calyx with rounded teeth, puberulous outside; anthers broadly ovate and with the tips exserted... 3. *A. oligophylla.*

Leaves 5 to 8 in. long; leaflets 5 or more; all parts of the flower glabrous 4. *A. glabriflora.*

Leaves 7 or 8 in. long, leaflets 5 to 8, subglaucous beneath; sepals free, pubescent outside; flowers ovoid, ·1 in. long 5. *A. glaucescens.*

Leaves 6 to 12 in. long, leaflets 7 to 9, the calyx toothed, lepidote-pubescent outside; flowers depressed-hemispheric, ·05 in. in diam. ... ... 6. *A. Scortechinii.*

Leaves 12 to 24 in. long; leaflets about 15, brown when dry; calyx toothed, puberulous; flowers obovate, ·15 in. long 7. *A. Ganggo.*

Leaves 18 to 36 in. long; leaflets 11 to 13, pale when dry; calyx puberulous; flowers ·05 to ·075 in. in diam., depressed-globular ... ... 8. *A. leucophylla.*

Leaflets glabrous above, lepidote but not pubescent on the lower surface.

Flowers depressed-globular, not more than ·04 in. in diam., on pedicels as long as or longer than themselves.

Calyx with 4 or 5 long spreading unequal teeth nearly as long as the petals 9. *A. cinerea.*

Calyx with 5 orbicular blunt spreading lobes much shorter than the petals ... 10. *A. odoratissima.*

Flowers ovoid or obovoid-globose, ·05 in. or more in diam., on pedicels shorter than themselves.

Flowers ovoid, ·08 in. long; calyx sub-campanulate, densely pubescent outside with 5 deep broadly ovate lobes; scales on under surface of leaflets minute and not shining ... ... 11. *A. Forbesii.*

Flowers ovoid, ·05 in. long; calyx cupular, pale-coloured, almost glabrous, divided to the base into 5 shallow broad blunt lobes; scales on lower surface of leaflets shining ... ... 12. *A. squamulosa.*

Flowers obovoid-globose, ·08 in. long; calyx with 5 broad shallow rounded spreading lobes minutely whitish tomentose with superficial stellate-hairy bright rusty scales; scales on lower surface of leaflets sparse stellate-hairy ... 13. *A. Kunstleri.*

Leaflets more or less glabrous on the upper, pubescent on the lower surface.

Panicles small with very short few-flowered branches ... ... 14. *A. humilis.*

Panicles condensed; flowers densely crowded, sessile.

Leaflets on the under surface covered with minute tomentum with stellate hairs intermixed, and with superficial shining scales; flowers sub-globular, petals orbicular ... . 15. *A. argentea.*

Leaflets as in *A. argentea*, petals elliptic, flowers ovoid ... ... 15. *A. argentea. var. Curtisii.*

Leaflets tomentose on the lower surface, scales if any not shining; petals elliptic, flowers ovoid ... ... 15. *A. argentea. var. eximia.*

Panicles not condensed, their main branches spreading, the ultimate divisions short densely flowered spikes; flowers depressed-globular, sessile.

Flowers ·1 in. in diam.,

Main nerves of leaves 28 to 36 pairs: panicles 9 to 12 in. long ... ... 16. *A. lanuginosa.*

Main nerves of leaves 16 to 24 pairs; panicles 6 to 8 in. long ... ... 17. *A. Curtisii.*

Flowers ·025 to ·4 in. in diam.

Calyx very tomentose and with 5 long narrow acute or sub-acute spreading unequal lobes some of them longer than the petals.

Leaves 4 to 9 in. long: leaflets not cordate at the base, 1·5 to 5 in. long; main nerves 6 to 11 pairs, spreading, fruit ellipsoid ... 18. *A. Palembanica.*

Leaves 7 to 15 in. long; leaflets minutely cordate at the base, 4 to 6 in. long; main nerves 10 to 14 in., oblique: fruit globular or ovoid ... 19. *A. cordata.*

Calyx much shorter than the petals and with broad short imbricate lobes.

Calyx quite glabrous ... ... 20. *A. Hiernii.*

Calyx pubescent outside; fruit pyriform, 1·75 in. long ... ... 21. *A. Griffithii.*

Panicles lax, spreading; flowers not crowded, depressed-globular, globular or obovoid, sub-sessile or pedicelled.

Flowers sub-sessile, anthers exserted.

Flowers ·035 in. in diam., depressed-globular, sub-sessile: calyx rotate and with 5 deep broad rounded membranous pubescent lobes: staminal tube short, cupular, sub-entire, glabrous. Fruit ovoid-globose, tapering into a pseudo-stalk, 1 in. long ... 22. *A. membranifolia.*

Flowers pedicelled, anthers included.

Flowers ·05 in. long, globular, on pedicels longer than themselves. Calyx cupular with 5 acute spreading teeth stellate-pubescent outside. Staminal tube globular, inflated about the middle, glabrous, the mouth sub-entire: fruit obovoid, rugulose, about ·4 in. long ... 23. *A. tenuicaulis.*

Flowers ·06 in. long, obovoid, on pedicels shorter than themselves; Calyx cupular, pubescent outside, with 5 blunt rotund spreading lobes; staminal tube obovoid, 5-toothed, puberulous; fruit globular to ovoid, ·4 to ·6 in. long ... ... 24. *A. trichostemon.*

STAMENS 7 TO 9.

Panicles 12 in. long: calyx with 4 broad valvate unequal teeth; stigma long, narrow, deeply 3-grooved, ovary 3-celled ... 25. *A. macrostigma.*

Panicles 2·5 to 6 in. long.

Calyx fleshy, pellucid-dotted, with 5 broad imbricate lobes: stigma thick, cylindric, 2-lobed; ovary 2-celled ... 26. *A. heteroclita.*.

Calyx with 5 minute erect pointed teeth: stigma capitate, 2- 3-angled ... 27. *A. andamanica.*

STAMENS 10 ... ... 28. *A. Maingayi.*

1. AGLAIA FUSCA, n. sp. King. A tree, young branches cinereous, at first covered with a thin layer of deciduous minute pale rusty scurfy tomentum, afterwards glaberulous. *Leaves* 6 to 10 in. long, equally or unequally pinnate; leaflets coriaceous, alternate, sub-opposite (the upper pair opposite) oblong-lanceolate to ovate-lanceolate, shortly acuminate or acute, the base cuneate or sometimes rounded; upper surface glabrous and shining; the lower glabrous, minutely punctulate, the midrib rusty-puberulous; main nerves 7 to 9 pairs, ascending; length 2·5 to 4·5 in., breadth 1 to 1·75 in.; petiolules ·35 in., that of the odd leaf (when present) longer. *Panicles* axillary, solitary, much shorter than the leaves, with rather long peduncles, the branches few, the flowers rather crowded. *Flowers* globular, ·05 in. in diam., on pedicels rather shorter than themselves. *Calyx* of 4 unequal rotund sepals, scaly externally. *Petals* 4, rotund, concave, glabrous, larger than the sepals. *Staminal tube* globular-obovoid, much thickened inside below each anther, glabrous, the mouth small annular, sub-entire; *anthers* 4, shortly and thickly ovate, inserted near the mouth. *Ovary* (rudimentary) pubescent; *stigma* long, cylindric, glabrous. *Fruit* globular with a small apiculus, minutely rusty-tomentose, ·3 in. in diam. (not ripe), one-celled and one-seeded by abortion.

South Andaman: King's Collector.

In the fruit distinct remains of a second cell are found. The species is closely allied to *A. fuscescens*, but is distinguishable by its thicker narrower leaflets with midribs hairy below, much smaller flowers, and more globose staminal tube which appears never to have more than 4 anthers. Flowers with perfect pistils have not yet been found.

2. AGLAIA ODORATA, Lour. Fl. Coch. Chin. 173. A shrub or small tree; young shoots slender, rusty stellate-lepidote. *Leaves* trifoliolate, 2·5 to 5 in. long; leaflets thinly coriaceous, ovate- or obovate-oblong, the

apex obtuse or tapered to each end or sub-rhomboidal: the terminal one the largest and tapering into the petiole: both surfaces glabrous, minutely reticulate when dry: main nerves 6 to 8 pairs, curving, indistinct; length of lateral pair 1·25 to 2 in., of terminal one 2·5 to 3·5 in. *Panicles* often longer than the leaves, lax. *Flowers* ·1 in. long, on pedicels of about the same length, glabrous. *Calyx* with 5 deep elliptic lobes. *Petals* unequal, orbicular or sub-orbicular. *Staminal tube* campanulate, with 5 broad truncate teeth; *anthers* 5, elliptic, included. *Fruit* unknown.

Malacca, Penang and Singapore; but probably only cultivated. Distrib. China and Siam.

3. AGLAIA OLIGOPHYLLA, Miq. Fl. Ind. Bat. Suppl. 507. A small tree 15 to 20 feet high: young branches covered with deciduous cinereous scurf. *Leaves* 5 to 9 in. long, unequally pinnate, the petioles and rachises puberulous, soon becoming glabrous; leaflets 3 to 5, membranous, the pairs opposite, the terminal one the largest, obovate-oblong to elliptic, shortly and often bluntly acuminate, the base cuneate, sometimes oblique: both surfaces glabrous, reticulate when dry; main nerves 5 or 6 pairs, ascending, curving; length 3 to 6 in., breadth 1·5 to 2·5 in.; petiolules ·4 to ·5 in., swollen at the base. *Panicles* axillary, 1·5 to 4 in. long, at first scurfy, but ultimately sub-glabrous, much branched, bracteolate. *Flowers* ·075 in., in diam., on slender pedicels as long as themselves, globular. *Calyx* cupular, flat, with 5 spreading rounded concave teeth, puberulous externally, the edges ciliolate. *Petals* much longer than the calyx, orbicular, concave, glabrous. *Staminal tube* shorter than the petals, globular-turbinate, 5-grooved, the mouth with 5 broad blunt teeth; *anthers* 5, broadly ovate, the tips only exserted. *Ovary* depressed; *stigma* conical, pubescent. *Fruit* globular, with the calyx persistent at its base, densely and minutely tawny-pubescent, ·5 or ·6 in. in diam.; the pedicels stout, glabrous ·1 in. long. Kurz For. Flora Burma I, 220; C. DC. Monogr. Phaner. I, 607; Miq. Ann. Mus Lugd. Bat. IV, 41. *Meliaceae Singapuriana ?* *Walsura* Wall. Cat. 4887.

Singapore: Wallich. Perak: King's Collector, No. 3968. Distrib. Burmah, Helfer (Kew Distrib.), No. 1046. Sumatra.

4. AGLAIA GLABRIFLORA, Hiern in Hook. fil. Fl. Br. Ind. 1. 555. A glabrous tree 15 to 25 feet high. *Leaves* 5 to 8 in. long, unequally pinnate, the petioles and rachises angled: leaflets about 8 opposite and one odd, membranous, usually ovate, rarely lanceolate, bluntly acuminate, the base cuneate, rarely rounded; when dry the upper surface shining, the lower dull; main nerves 4 pairs, ascending, curving, obsolete on the upper, slightly prominent on the lower surface; length 2 to 2·75 in., breadth ·75 to 1·25 in., petiolules ·15 to ·2 in. *Panicles* solitary, axillary, spreading, 1·5 to 4 in. long. *Flowers* numerous, ·1 in. long, their

pedicels usually shorter but sometimes longer than themselves. *Calyx* cupular, fleshy, with 5 broad shallow rounded teeth. *Petals* 5, much longer than the calyx, ovate, concave, the edges thin. *Staminal tube* shorter than the petals, urceolate, the edge sub-entire; *anthers* 5, elliptic, sub-cordate, deeply included. *Ovary* short, depressed, pubescent; *stigma* long, cylindric, glabrous. *Fruit* reniform, compressed, cinerous, puberulous, 2-celled, 2-seeded, ·6 in. in diam. C. DC. Monogr. Phaner. I, 608.

Malacca: Griffith, Nos. 1041, 1042. Maingay (Kew Distrib.) No. 336. Perak: King's Collector, Nos. 10617, 10724. Scortechini, No. 482. Singapore: Ridley, Nos. 1812, 3898.

5. **AGLAIA GLAUCESCENS**, n. sp. King. A shrub: young branches rather slender, the bark when dry cinereous lenticellate; while young covered with pale rusty minute scurfy tomentum. *Leaves* 7 or 8 in. long, equally or unequally pinnate: leaflets 5 to 8, thinly coriaceous, oblong or elliptic-oblong or obovate-oblong, sub-acute, the base cuneate, both surfaces glabrous, the upper shining, the lower dull and sub-glaucеous; main nerves 8 to 10 pairs, ascending, rather straight, slightly prominent on the lower surface; length 3·5 to 5·5 in., breadth 1·75 to 2 in. (rarely 3 in.), petiolules ·35 to ·5 in. *Panicles* solitary, axillary, nearly as long as the leaves, branching from near the base, very lax, few-flowered. *Flowers* ovoid, ·1 in., long, on pedicels about as long as themselves. *Calyx* of 4 or 5 ovate concave ascending sepals, pubescent externally. *Petals* 4 or 5, larger than the sepals, thick, elliptic, obtuse, glabrous. *Staminal tube* nearly as long as the petals, cylindric, widening at the sub-entire mouth; *anthers* 4 or 5, shortly and broadly ovate, attached near the apex of the tube, included. *Ovary* shortly and narrowly cylindric, pubescent, crowned by the glabrous cylindric stigma. *Fruit* unknown.

South Andaman Island: King's Collectors.

6. **AGLAIA SCORTECHINII**, King, n. sp. A tree; young shoots slender and, like the slender petioles, rachises, petiolules and inflorescences, with very minute brown scales. *Leaves* 6 to 12 in. long, unequally pinnate; leaflets 7 to 9, the pairs opposite, membranous, lanceolate or oblong-lanceolate, shortly acuminate, much cuneate at the base; both surfaces quite glabrous, pale brown when dry; the 7 to 10 pairs of main nerves indistinct; length 3·5 to 5 in. *Panicles* 7 to 9 in., the branches long, divaricating, lax. *Flowers* depressed-hemispheric, ·05 in. in diam., on slender pedicels longer than themselves. *Calyx* short, spreading, with 5 deep orbicular concave lobes, lepidote-pubescent externally. *Petals* 5, orbicular or ovate-orbicular, concave, glabrous, much larger than the calyx. *Staminal tube* shorter than the petals, widely depressed-campanulate, the mouth with several broad much inflexed teeth, glabrous;

anthers 5, elliptic, included. *Ovary* small, depressed; *stigma* globose. *Fruit* unknown.

Perak: Scortechini, No. 722.

The nearest ally of this is *A. speciosa*, Blume, which, however, has leaflets of thicker texture, with more numerous and distinct nerves and squamulose on the under surface. The flowers of the two also differ slightly, those of *A. speciosa*, although similar in calyx and corolla, having a staminal tube with a wide open mouth, without inflexed teeth and from which the anthers are partly exserted.

7. AGLAIA GANGGO, Miq. Flor. Ind. Bat. Suppl. 506. A tree: young branches, petioles, midribs and inflorescences covered with minute rusty scales. *Leaves* 10 to 24 in. long, equally or unequally pinnate; leaflets 10 to 15, opposite or alternate, sub-coriaceous, narrowly oblong or oblong-lanceolate, shortly and rather abruptly acuminate; the base cuneate, unequal-sided: both surfaces free from hairs, but covered with very minute scale-like pustules: main nerves 12 to 18 pairs, faint, spreading: length 3 to 5·5 in., breadth 1 to 1·75 in., petiolule ·15 to ·35 in. *Panicles* solitary, axillary, nearly as long as the leaves, the lower branches distant, all more or less spreading, the flowers on the ultimate branchlets rather crowded. *Flowers* ·1 to ·15 in. long, ovoid, sub-sessile. *Calyx* cupular, minutely pubescent and scaly outside, the mouth with 5 broad blunt erect teeth. *Petals* 5, larger than the calyx, elliptic, concave, blunt, glabrous. *Staminal tube* shorter than the petals, ovoid, the mouth small, circular, not toothed; *anthers* 5, narrowly elliptic, included. *Ovary* small, depressed, 3-angled, densely hairy, crowned by the glabrous cylindric grooved stigma. *Fruits* on short stout pedicels, reniform, compressed, 2-celled, 2-seeded, minutely rusty-lepidote, ·5 in. broad (perhaps not quite ripe). Miq. Ann. Mus. Lugd. Bat. IV, 47. C. DC. Phaner. Monogr. I, 27.

South Andaman, Nicobar Islands; King's Collector. Distrib. Sumatra.

The flowers of the Andaman specimens agree exactly with those from Sumatra on which Miquel founded the species which is a very distinct one. On each panicle, there appear to be certain flowers with perfect and others with imperfect ovaries. The panicles bearing fruit are thus in size and ramification exactly like those bearing flowers. *A. Forsteni*, a species founded by Miquel (Ann. Mus. Lugd. Bat. IV, 46) on specimens collected in Amboina does not appear to me to be really distinct from this. Under the name of *Aglaia Ganggo*, Miq., I believe there have been issued from the Calcutta Herbarium some specimens of a Perak plant (King's Collector, No. 4606), which much resembles this in leaves and inflorescence, but which has a very different staminal tube.

8. AGLAIA LEUCOPHYLLA, King, n. sp. A tree 40 to 60 feet high; all parts quite glabrous; young branches rather stout, pale, cinereous when dry and slightly rough. *Leaves* 2 to 3 feet long, unequally pinnate; the petioles very long, minutely rugulose when dry; leaflets 11 to 13, membranous, the lower alternate and distant, the upper opposite, oblong-lanceolate to elliptic-oblong or ovate, all with acuminate apices and cuneate bases, the lower half sometimes very narrow; main nerves 9 to 15 pairs, spreading, curving, invisible on the upper but distinct on the lower surface; length 6 to 12 in., breadth 1·25 to 3 in.; petiolules ·25 to ·6 in., slender. *Panicles* extra-axillary, slender, rugulose, the branches spreading but slightly. *Flowers* ·05 to ·075 in. in diam., depressed-globular, on pedicels longer than themselves. *Calyx* much smaller than the petals, pale-coloured, puberulous, with 5 deep acute or sub-acute spreading lobes. *Petals* 5, dark-coloured when dry (yellow when fresh), orbicular, concave, glabrous. *Staminal tube* turbinate, the mouth 5- or 6-lobed; *anthers* 5 or 6, broadly ovate, the connective slightly apiculate at the apex, the apices bent downwards and not exserted. *Ovary* broad, depressed, pubescent: *stigma* broadly ovoid, the apex sub-2-lobed. *Fruit* (not ripe), obovoid, with depressed sub-bi-lobed apex; the slightly enlarged calyx persistent at the base, minutely cinereous, tomentose.

Perak: King's Collector, Nos. 1874, 2998 and 6494. Wray, No. 2935.

There is some diversity in the size of the leaflets and of the flowers of this species. My collector's gathering No. 2998 above-quoted has narrowly oblong-lanceolate leaflets, and its flowers measure scarcely ·05 in diam.: while the flowers of No. 1874 are quite ·075 in. in diam., and the leaflets of all the other gatherings, except No. 2998, are either elliptic-oblong or ovate. I find that the structure of the flowers is alike whatever their size may be.

9. AGLAIA CINEREA, King, n. sp. A shrub 10 to 15 feet high: young branches petioles, rachises, petiolules and inflorescences with numerous minute brown scales. *Leaves* 7 to 12 in. long, unequally pinnate: leaflets 5 to 7, alternate and rather distant; the uppermost pair opposite, thinly coriaceous, oblong- or ovate-lanceolate, often oblique, the apex shortly acuminate, the base cuneate, that of the upper three much narrowed in the lower third; both surfaces cinereous when dry, the lower paler and sparsely covered with rusty stellate scales; main nerves 8 to 13 pairs, oblique, rather straight; length 2·5 to 6 in., breadth 1 to 1·75 in.; petiolules ·35 to ·6 in., that of the odd leaflet sometimes ·8 in. *Panicles* supra-axillary, slender, lax, 5 to 7 in. long, the branches divaricating. *Flowers* small, ·04 in. in diam., globu-

lar, on slender pedicels longer than themselves. *Calyx* with 4 or 5 long spreading unequal blunt lobes nearly as long as the petals, pubescent-lepidote externally. *Petals* 5, concave, rotund, unequal, glabrous. *Staminal tube* shorter than the petals, shortly campanulate with a truncate entire mouth, glabrous: *anthers* 5, shortly ovate, exserted. *Ovary* and stigma both depressed. *Fruit* pyriform with a long pseudo-stalk and on a short stout pedicel, minutely pubescent-lepidote, ·75 in. long, and ·4 in. diam. near the apex.

Malacca: Griffith. Perak: King's Collector, Nos. 2730 and 5285. Scortechini No. 347.

10. AGLAIA ODORATISSIMA. Blume Bijdr. 171. A tree 20 to 40 feet high: young branches petioles rachises petiolules and inflorescences with minute brown deciduous scales. *Leaves* 5 to 9 in. long, unequally pinnate; leaflets 5 to 7, oblong-lanceolate, rarely ovate, opposite, thinly coriaceous, shortly acuminate, the base cuneate or rounded; upper surface glabrous, greenish when dry, the lower brown, sparsely (the midrib and nerves rather densely) lepidote; main nerves 6 to 9 (rarely 11) pairs, ascending, curved; length 2 to 5 (occasionally 7) in.,; breadth 1 to 2 (occasionally 2·5) in.; petiolules ·2 in., that of the terminal one sometimes ·3 in., *Panicles* supra-axillary, solitary, 3 to 8 in. long, (occasionally 10 to 12) in., the branches divaricating, densely-flowered. *Flowers* depressed-globular, about ·035 in. in diam., on pedicels about as long. *Calyx* cupular, or rather flat, short, with 5 orbicular blunt spreading lobes, pubescent-lepidote outside. *Petals* 5, much longer than the calyx, elliptic or obovate-rotund, unequal, blunt, concave, glabrous, sometimes granular outside. *Staminal tube* shorter than the petals, truncate-campanulate, the mouth open, obscurely 5-lobed: *anthers* broadly ovoid, inserted by a very short filament just below the mouth of the tube, exserted, or inflexed and therefore included. *Ovary* small, depressed, pubescent; *stigma* small, broadly ovoid. *Fruit* ovoid or sub-globose, densely covered with minute brown scales, about ·6 in. long, and ·4 in. in diam., usually 1-seeded. Miq. Fl. Ind. Bat. Vol. I, pt. 2, p. 544; Ann. Mus. Lugd. Bat. IV. 44. C. DC. Monogr. Phaner. I, 602. *A. Roxburghiana* Hiern, Fl. Br. Ind. I, 555 and C DC. Monogr. Phaner. I, 604. (*not of Miquel.*) Aglaia? Wall. Cat. 9039? A. sexipetala, Griff. Notulæ I, 505.

Malacca; Griffith 1036; Maingay (Kew Dist.), No. 337. Perak: Scortechini, Wray, King's Collector. Singapore: Ridley. Penang: Curtis Nos. 662, 768, 895, 896, 2448. Distrib. Sumatra, Java.

Although resembling *A. Roxlurghiana*, Miq. in its calyx and corolla, that has a different staminal tube to which the strictly included more elliptic anthers are attached near the base, whereas the anthers of this species are shortly and broadly triangular ovoid and are inserted on the staminal tube close to its mouth. The fruits too are different.

11. AGLAIA FORBESII, King, n. sp. A tree 40 to 80 feet high: young branches slender and, like the angled petioles rachises and petiolules, densely and minutely rufous-tomentose. *Leaves* 12 to 15 in. long, equally pinnate; leaflets 8 to 10, membranous, alternate, rather distant, oblong to elliptic, alternate (the upper pair usually opposite) cuspidate, the base slightly cuneate; upper surface olivaceous when dry, glabrous, minutely rugulose, dull; the lower rather pale brown, minutely scurfy: main nerves 10 to 13 pairs, oblique, rather straight, faint on the upper, bold on the lower surface: length 3·5 to 5·2 in., breadth 1·5 to 2·5 in. *Panicles* axillary, solitary, densely stellate-tomentose, 4·5 to 9 in. long, the branches spreading. *Flowers* numerous, ·08 in. long, ovoid, on pedicels shorter than themselves. *Calyx* sub-campanulate, densely pubescent outside, glabrous inside, with 5 deep broadly ovate lobes. *Petals* 5, twice as long as the calyx, orbicular or ovate-orbicular, concave, glabrous. *Staminal tube* shorter than the petals, turbinate-globular, the mouth with 5 broad shallow erose teeth, glabrous; *anthers* 5, ovate, included or with their apices exserted. *Ovary* small, depressed, puberulous; *stigma* large, fleshy, broadly ovoid. *Fruit* ellipsoid to ovoid, sometimes slightly gibbous at the base, or narrowly obovoid, not apiculate, pale yellow when ripe, covered with minute scurfy pubescence, 1 to 1·25 in. long, and ·7 to ·9 in. in diam. when dry; the pedicel short, stout.

Perak: Wray, No. 3265: King's Collector, Nos. 4762 and 10787. Pangkore: Curtis, No. 1631. Distrib. Sumatra, H. O. Forbes, No. 3179.

12. AGLAIA SQUAMULOSA, King, n. sp. A tree 30 to 50 feet high: young branches rather stout, the bark striate and densely covered with minute brown scurf-like pubescence. *Leaves* 15 to 30 in., unequally pinnate, petiole rachis and petiolules minutely squamulose-pubescent: *leaflets* 11 to 15, distant, alternate except the upper pair which are opposite, coriaceous; both surfaces minutely rugulose when dry, the upper glabrous and dull, the lower uniformly covered with shining minute pale-edged scales: main nerves 10 to 12 pairs, oblique, little curved, faint on the upper, bold on the lower surface: length 4 to 10 in., breadth 1·75 to 3·5 in., petiolules ·25 to ·6 in. *Panicles* axillary, solitary, much branched, spreading, squamulose, angled, many-flowered, 10 to 12 in. long. *Flowers* ovoid, ·05 in. long, on pedicels shorter than themselves. *Calyx* cupular, pale-coloured, almost glabrous, divided to the base into 5 shallow broad blunt lobes. *Petals* 5, much longer than the calyx, dark-coloured, rotund, unequal, concave, glabrous. *Staminal tube* shorter than the petals, globose, the mouth

entire: *anthers* 5, ovate, large. *Ovary* rather large, pubescent, extending much beyond the base of the ovoid glabrous stigma. *Fruit* (very young) narrowly elliptic, densely scaly like the under surface of the leaflets.

Perak: King's Collector, Nos. 8805, 11013, 10145.

In its leaves this resembles *A. latifolia* Miq., but the scales on the under surface of this are much larger and more shining. The flowers too of this are much smaller and the calyx and corolla differ.

13. AGLAIA KUNSTLERI, King, n. sp. A tree 30 to 40 feet high; young branches rather stout and, like the petioles, rachises, petiolules and inflorescences, covered with minute deciduous, brown pubescence and scales. *Leaves* 18 to 25 in. long, unequally pinnate; leaflets 5 to 13, coriaceous, oblong-oblanceolate to elliptic-oblong, the apices shortly acuminate, the bases usually more or less oblique, rounded or cuneate, the upper leaflets often much narrowed in the lower third: upper surface glabrous, pale green, and minutely rugulose when dry, the lower paler, rugulose, and with sparse, stellate, hairy, minute brown scales: main nerves 10 to 14 pairs, faint on the upper, and only slightly prominent on the lower surface: length 4·5 to 7·5 in., breadth 1·75 to 2·75 in. *Panicles* solitary, axillary, branching, many-flowered, 3 to 9 in. long. *Flowers* ·08 in. long, globular-obovoid, on pedicels shorter than themselves. *Calyx* cupular, tapering to the pedicel, with 5 broad blunt spreading shallow lobes, minutely whitish-tomentose with bright rusty superficial stellate-hairy scales. *Petals* 5, much larger than the calyx, broadly elliptic, concave, blunt. *Staminal tube* dark-coloured, pale and scarious towards the base, shorter than the petals, globose, glabrous, 5-lobed; *anthers* 5, broadly ovate, included. *Ovary* rusty-pubescent; *stigma* thick, short, conical. *Fruit* globular, slightly depressed at base and apex, densely covered with minute pale buff-coloured hairs, about ·8 in. in diam. when dry, pedicel very short.

Perak: King's Collector, Nos. 5287, 10610.

14. AGLAIA HUMILIS, n. sp. King. A shrub or small tree; young branches stout, rusty puberulous, the bark dark-coloured. *Leaves* 18 to 26 in. long, unequally pinnate; *leaflets* sub-opposite (the upper pair opposite), thinly coriaceous, oblong to elliptic-oblong, rarely ovate, shortly cuspidate, the base rounded or sub-cuneate; both surfaces minutely punctulate when dry, the upper glabrous except the puberulous midrib; the lower glabrous, the midrib and nerves stellate-pubescent; main nerves 11 to 20 pairs, spreading, prominent on the lower, depressed on the upper surface when dry; length 4 to 9 in., breadth 1·75 to 3·5 in.; petiolules ·25 to ·6 in. *Panicles* supra-axillary, solitary, 3 to 6 in. long, with few-flowered very short branches. *Flowers* globular, ·05 in. in

diam. *Calyx* campanulate, pubescent-lepidote outside, the mouth with 5 large rounded teeth. *Petals* 5, longer than the calyx, elliptic, glabrous. *Staminal tube* shorter than the petals, obovoid-globose, glabrous, the mouth with 5 shallow broad blunt teeth; anthers 5, ovate-ellipsoid, included, short. *Ovary* rather broad, pubescent, with a large glabrous conical 2-lobed stigma. *Fruit* (young) globular-obovoid, 2-celled; the pericarp fleshy, cinereous-pubescent externally.

Perak: King's Collector, No. 8619; Wray, No. 3763.

15. AGLAIA ARGENTEA, Blume Bijdr. 170. A slender tree 10 to 15 or 20 feet high; young shoots, petioles, rachises, petiolules, inflorescences and under surfaces of the leaves densely covered with a layer of minute tomentum with many stellate hairs and flat shining white or pale-brown scales intermixed and on the surface. *Leaves* 24 to 30 in. long, unequally pinnate; leaflets 7 to 11, alternate, the odd one and the upper pairs often much the largest, thinly coriaceous, oblong-lanceolate to ovate-lanceolate or elliptic, the odd leaflet and often also the upper pair often much cuneate at the base, the lower pairs often rounded, occasionally minutely cordate and sub-sessile, the apices of all more or less acuminate: upper surface glabrous, the lower shining silvery to pale brown; main nerves 12 to 24 pairs, inconspicuous on the upper bold and prominent on the lower surface; length of the lower leaflets 5 to 9 in., of the terminal one 12 to 15 in., breadth 2 to 5 in., petiolules ·2 in. *Panicles* supra-axillary, pedunculate, spreading, very dense, 3 to 5 in. long. *Flowers* crowded, numerous, sessile, sub-globular, ·08 in. in diam., *Calyx* half as long as the corolla, deeply divided into 5 broad rounded imbricate concave lobes, furfuraceous-lepidote externally, glabrous internally. *Petals* 5, concave, orbicular, glabrous. *Staminal tube* globular, shorter than the petals, the mouth sub-entire; *anthers* 5, ovate, included. *Ovary* depressed; *stigma* sub-cylindric, truncate, glabrous. *Fruit* ovoid or obovoid, minutely rusty-pubescent and lepidote, ·8 to 1·25 in. long, Miq. Flor. Ind. Bat. Vol. 1, Pt. 2, 543; Ann. Mus. Lugd. Bat. IV, 54; Kurz For. Flor. Burma I, 219; C. DC. Monogr. Phaner. I, 618. *A. hypoleuca*, Miq. Ind. Bat. Suppl. 507. *A speciosa*, Teysm, and Binn. Cat. Hort. Bogor. 211 (not of Blume). *Milnea argentea*, Reinw. in Cat. Hort. Bogor. 71.

Perak: King's Collector, No. 3135. Nicobar Islands, Kurz.—Distrib. Burma, Sumatra, Java, New Guinea.

This is a widely distributed and variable species of which Miquel (Ann. Mus. Lugd. Bat. IV, 55) enumerates no less than seven varieties, most of which he had himself previously treated as species. In young shoots the leaflets are often few but very large.

Var. *eximia*, Miq. Ann. Mus. Lugd. Bat. IV, 55. *Flowers* ovoid;

petals elliptic, staminal tube ovoid; leaflets 15 to 25, oblong, opposite, sub-sessile, the bases rounded, 3 to 6 in. long, the terminal one not longer than the pairs but with a narrow base: under-surfaces from pale to cinnamoneous, not shining. *A. eximia*, Miq. Fl. Ind. Bat. Suppl. 506. *A. ancolana* Miq. l. c. 506.

Perak: King's Collector, Nos. 5767 and 10007. Distrib. Sumatra.

Var. *Curtisii*, King. *Flowers* ovoid, ·15 in. long: *petals* elliptic; *staminal tube* globular, the apical aperture very small and almost entire. *Leaflets* 15 to 19, oblong, shortly acuminate and with rounded bases, the terminal one not larger than the others. *Fruit* narrowly pyriform, densely lepidote.

Penang; Curtis, No. 2287. Perak: King's Collector, No. 8239.

16. AGLAIA LANUGINOSA, King, n. sp. A tree 50 to 70 feet high; young branches very stout (1 in. in diam.), rugulose and rusty-tomentose between the large triangular leaf-cicatrices. *Leaves* 2 to 4 feet long, unequally pinnate everywhere, except on the upper surfaces of the leaflets, densely covered with soft rusty stellate tomentum; leaflets 9 to 13, the pairs opposite, thinly coriaceous, oblong, cuspidate, the base rounded and often minutely cordate; upper surface glabrous; main nerves 28 to 36 pairs, sub-horizontal, slightly prominent on the lower, faintly depressed on the upper surface; length 5 to 15 in., breadth 2 to 3·5 in., petiolules ·25 to ·4 in. *Panicles* axillary, from 9 to 12 in. long, stout; branches few, ascending and bearing short lateral spikes. *Flowers* sessile, densely crowded, depressed-globular, about ·1 in. in diam. *Calyx* completely enveloping the petals, with 5 deep narrow lobes covered outside with soft stellate wool, inside glabrous. *Petals* 5, elliptic, blunt, glabrous, concave, slightly shorter than the calyx. *Staminal tube* shorter than the petals, its mouth wide and deeply 5-lobed, glabrous; *anthers* opposite its lobes, large, included. *Ovary* small; *stigma* cylindric. *Fruit* unknown.

Perak: Scortechini, No. 1682; King's Collector, Nos. 7381, 7714.

This species resembles the Bornean *A. grandis*, Miq. in its leaves, but has different flowers. *Fruit* of both species is unknown.

17. AGLAIA CURTISII, King, n. sp. A tree 60 to 80 feet high; young branches stout, rusty puberulous. *Leaves* 18 to 30 in. long, unequally pinnate; leaflets coriaceous, 11 to 15, sub-opposite, oblong to elliptic, shortly acuminate; the bases of the lower rounded, of the upper cuneate; upper surface glaberulous and when dry minutely pustulate, the midrib puberulous; under surface covered with dense minute rusty tomentum with numerous stellate hairs on the surface; main nerves 16 to 24, spreading, prominent beneath; length 6 to 9 in., breadth 2 to 4 in., petiolules ·2 to ·35 in. *Panicles* slightly supra-axillary, solitary, 6

to 8 in. long, with few sub-erect branches; the branchlets short, densely flowered, all scurfy puberulous. *Flowers* globose, sessile, more than ·1 in. in diam. *Calyx* of 4 or 5 thick densely tomentose sub-rotund sepals. *Petals* 5, glabrous. *Staminal tube* short, sub-globular, with a wide mouth; *anthers* 5, short, attached close to the mouth of the tube, their apices included. *Fruit* globular-obovoid, minutely rusty puberulous, 1·5 in. long, and 1·25 in. in diam.

Pangkore: Curtis, No. 1627. Perak; King's Collector, No. 7786.

A species allied to *A. pachyphylla*, Miq., and not easy by description alone to be distinguished from that species. An examination of Miquel's type specimen of *A. pachyphylla* kindly lent to me by the authorities of the Leiden Herbarium shows that the leaves of that are distinctly falcate, while those of this are not: moreover the leaves of *A. pachyphylla* taper much more to the apex, and the panicles are more robust, than is the case in this species. The tomentum on the under surface of the leaves differs in character in the two species; and in the leaves of *A. pachyphylla* the midribs of the leaves are raised and ridge-like on the upper surface, while these of this species are depressed. The fruit of *A. pachyphylla* is unknown.

18. AGLAIA PALEMBANICA, Miq. Flor. Ind. Bat., Suppl. 507. A tree 10 to 25 feet high; young shoots, petioles and rachises, petiolules and infloresceuse densely rusty stellate-tomentose. *Leaves* 4 to 9 in. long, unequally pinnate; *leaflets* 5 to 9, sub-opposite, membranous, oblong-lanceolate to ovate, opposite or sub-opposite, shortly acuminate, the base cuneate, the terminal and upper pairs of leaflets with bases much narrowed; upper surface sometimes deciduously lepidote, ultimately glabrous, except sometimes the pubescent lower half of the midrib; lower surface more or less closely stellate-pubescent, especially on the midrib and 6 to 11 pairs of spreading main nerves; length 1·5 to 5 in., breadth ·65 to 1·75 in., petiolules ·15 in. *Panicles* solitary, axillary, 1·5 to 4 in. long, slender, their branches short and divaricating, bearing the flowers in dense short spikes. *Flowers* depressed-globular, about ·025 in. in diam. *Calyx* with 5 long narrow acute or sub-acute spreading unequal lobes, some of them occasionally longer than the petals, boldly stellate-tomentose outside, glabrous inside. *Petals* 5, obovate-elliptic, concave, glabrous. *Staminal tube* shorter than the petals, glabrous, its mouth truncate entire; anthers 5, ovate, curved, half-exserted. *Ovary* large, pubescent, stigma 3-angled. *Fruit* ellipsoid (narrowly so when young), deciduously stellate-tomentose, ·75 in. long, and ·6 in. in diam. Miq. Ann. Mus. Lugd. Bat. IV., 52; Hiern in Hook. fil. Fl. Br. Ind. I, 557; C. DC. Monogr. Phaner. I, 619. *Aglaia Sipannas*, Miq. Fl. Ind. Bat. Suppl. 508. *A. tomentosa*, Teysm. and Binn. in Nat. Tijdschr. Ned.

Ind. Vol. 27. p. 43. *A. rufa*, Miq. in Ann. Mus. Lugd. Bat. IV, 649. C. DC. Monogr. Phaner. I, 613.

Malacca: Griffith, No. 1043. Maingay (Kew Distrib.), No. 333. Penang: Curtis, No. 2003; King's Collector, No. 1790. Perak: Scortechini, Wray, King's Collector. Kedah: Curtis, No. 2520. DISTRIBUTION: Sumatra, Bangka, Borneo.

This differs from its nearest ally *A. Griffithii* in its large, irregularly lobed, very tomentose calyx, and in its smaller fruit and leaves. I have examined authentic specimens of *A. Sipannas*, Miq. and of *A. rufa*, Miq., and I cannot see how they are to be separated from *A. palembanica*, Miq. A specimen in the Leiden Herbarium, collected by Korthals in Sumatra, and named in Miquel's handwriting *A. elliptica*, Blume, var. *Sumatra*, ought in my opinion to be referred to this species. The plant named by Teysmann and Binnindyk *A. tomentosa*, and of which Curtis's specimen from Kedah, No. 2520, is an example, has longer leaflets than typical *A. palembanica*, with more nerves, and more tomentose beneath; but I think its reduction to this is justifiable. This plant has a wider distribution than is usual with species of this family, and slight local differences are thus naturally to be expected.

19. AGLAIA CORDATA, Hiern in Hook. fil. Fl. Br. Ind. I, 557 (excl. var. 2). A tree 20 to 30 feet high; young shoots, petioles, rachises, petiolules and inflorescence more or less densely clothed with rusty or tawny stellate-tomentum. *Leaves* 7 to 15 in. long, unequally pinnate; leaflets 7 to 9, the pairs opposite, rarely sub-opposite, membranous, oblong-oblanceolate, rarely ovate or elliptic, all with shortly acuminate apices, the odd one the largest and much attenuate towards the base, the paired leaflets cuneate, minutely cordate at the very base; upper surface glabrous, the midrib slightly pubescent; the lower stellate-pubescent, sometimes densely so, the midrib always, and the nerves usually, tomentose; main nerves 10 to 14 pairs, oblique, slightly depressed on the upper surface when dry and prominent on the lower: length 4 to 6 in., breadth 1·75 to 2·25 in., petiolules less than ·1 in. or absent; the terminal leaflet larger and with a petiolule ·2 to ·4 in. long. *Panicles* axillary, solitary, 3 to 6 in. long, the branches spreading, the ultimate branchlets shorter, spike-like, and densely crowded with flowers. *Flowers* about ·35 in. in diam., sub-sessile, otherwise as in those of *A. palembanica*. *Fruit* globular or ovoid, densely covered with deciduous rusty stellate tomentum, ·5 to ·65 in. in diam. C. DC. in Monogr. Phaner. I, 618 (excl. var. b. *calyce glabro*).

Malacca: Maingay (Kew Distrib.), Nos. 334, 335/2. Singapore: Ridley, No. 333. Perak: Scortechini; Wray, No. 2962; King's Collector, Nos. 2836, 3646, 5071, 6360.

Under his species *A. cordata*, Mr. Hiern has in my opinion included two plants. The species *A. cordata*, as here limited, includes only Hiern's form with hirsute calyx, and is really little more than a large-leaved variety of *A. palembanica*. Mr. Hiern's form with glabrous calyx is, in my opinion, a distinct species, the calyx differing not only in being glabrous, but in being much smaller, and of quite a different shape. I have described it as a species under the name *A. Hiernii*.

20. AGLAIA HIERNII, King, n. sp. A tree 40 to 80 feet high; young branches, petioles, rachises, petiolules and inflorescences, densely clothed with rather soft rusty stellate tomentum. *Leaves* 14 to 18 in. long, unequally pinnate; leaflets 7 to 9, the pairs opposite, thickly membranous, oblong or oblong-lanceolate; the terminal one oblong-oblanceolate, longer than the others and two or three times as long as the petiolule; the apices of all shortly and sharply acuminate, the bases cuneate, especially of the uppermost ones; upper surface glabrescent with a few scattered stellate-hairs, the midrib and nerves densely stellate-pubescent; under-surface uniformly covered with pale-brown-centred scales and a superficial layer of rufous stellate tomentum; main nerves 13 to 22 pairs, sub-horizontal, depressed on the upper and bold on the lower surface when dry; length 4 to 6 in. (the odd one an inch longer); breadth 1·75 to 2·25 in., petiolules of the pairs ·15 in. *Panicles* slightly supra-axillary, solitary, 8 to 12 in. long, the branches divaricating, the ultimate branchlets bearing densely-flowered spikes. *Flowers* ·4 in. long, sessile, globular. *Calyx* cupular, quite glabrous, with 4 or 5 deep broad rounded imbricate lobes. *Petals* 5, rotund or ovate-rotund, unequal, much longer than the calyx, the outer 3 the largest, all concave and glabrous. *Staminal tube* shorter than the petals, cup-shaped, the mouth wide; the 5 ovate *anthers* inserted by very short filaments on the edge of the tube, but inflexed so as to be included. *Ovary* small, pubescent; *stigma* depressed-spheroidal, pubescent. *Fruit* unknown.

Malacca: Maingay. Perak: King's Collector, Nos. 5976, 6706, 10877.

This is allied to *A. cordata*, Hiern, but differs from it in having leaflets with more numerous and more horizontal main nerves, more densely tomentose and lepidote beneath. The calyx of this, moreover, is conspicuously different, being smaller, having broad lobes much shorter than the petals, and quite glabrous, while the calyx of *A. cordata*, as limited here, has a large calyx densely stellate-tomentose externally, and with acute lobes often longer than the petals. This is a large tree, often attaining a height of 80 feet, while *A. cordata* is a small tree from 20 to 30 feet high.

21. AGLAIA GRIFFITHII, Kurz in Journ. As. Soc. Bengal, for 1875, p. 146. A tree 30 to 50 feet high; young branches petioles, rachises, petiolules and inflorescences densely clothed with minute rusty stellate pubescence. *Leaves* 12 to 18 in. long, unequally pinnate; leaflets 13 to 19, opposite or sub-opposite, narrowly elliptic or oblong-lanceolate, often slightly oblanceolate, shortly acuminate, the base rounded or sub-cuneate: upper surface glabrous except the rusty tomentose midrib, the nerves inconspicuous; lower surface sparsely stellate-pubescent, the midrib and 10 to 12 pairs of bold curved spreading nerves tomentose; length 2·5 to 5 or even 6 in., breadth 1 to 1·4 in., petiolules about ·15 in. *Panicles* solitary, axillary, spreading, many-branched, many-flowered. *Flowers* about ·025 in. in diam., depressed-globular, broader than long. *Calyx* cupular with 5 deep broad lobes, pubescent outside. *Petals* 5, twice as long as the calyx, concave, glabrous. *Staminal tube* shorter than the petals, glabrous; *anthers* 5, ovate, partly exserted. *Ovary* pubescent; *stigma* depressed-hemispheric. *Fruit* pyriform, densely covered with sub-deciduous rusty scurfy stellate tomentum, 1·75 in long, and 1·25 in. in diam. Kurz For. Flora Burma I, 219. *A. minutiflora* Bedd. var. *Griffithii*, Hiern in Hook. fil. Fl. Br. Ind. I, 557: C. DC. in Phaner. Monogr. I, 616.

Malacca: Griffith, Nos. 1039 and 1040: Maingay, No. 334-2 (No. 334 is *A. cordata*, Hiern). Perak: Scortechini, Wray, King's Collector, Nos. 4231, 6282, 6341, 6346, 10285, 10925, 10957.

The flowers of this are less than half the size of those of *A. minutiflora* Bedd.—a plant of Western Peninsular India, of which Mr. Hiern and M. C. De Candolle make this a variety. On dissecting male flowers of an authentic specimen of Beddome's plant I find, however, that not only are the flowers larger, but they are of a different shape, being globular-obovoid, while those of this plant are depressed-globular and broader than long. The calyx of this, moreover, is about half as long as the petals, while the calyx of Beddome's plant is not more than a third or a fourth of the length of its petals. Moreover, the leaflets of *A. minutiflora* Bedd., are less numerous than in this plant, and the tomentum on their lower surface is much more dense. The fruit hitherto described as belonging to this plant, is that issued from Kew as No. 334 of Maingay's Herbarium. That fruit, however, does not belong to this species, but to *A. cordata*, Maing. It is globular and, in size as well as in shape, greatly resembles that of *A. minutiflora*. The true fruit of this (now described for the first time) is pyriform and much larger than that of *A. minutiflora*. On account of these differences, I therefore follow Kurz in regarding this as a distinct species from the latter.

22. AGLAIA MEMBRANIFOLIA, King, n. sp. A tree 20 to 60 feet high.

Leaves 2 to 3 feet long, the petioles, rachises and petiolules covered with minute harsh tomentum, unequally pinnate; leaflets from 7 to 11, thinly membranous, elliptic-oblong, acuminate, the base cuneate; upper surface glabrous, pale greenish when dry, the lower surface darker and sometimes with a tinge of purple, very sparsely and minutely stellate-pubescent, the midrib boldly so; main nerves 20 to 30 pairs, faint on the upper, bold on the lower surface; length 9 to 15 in., breadth 2·75 to 5·5 in., petiolules only about ·1 in. *Panicles* everywhere stellately rusty-pubescent, slightly suprà-axillary, with numerous, many-flowered, spreading branches. *Flowers* about ·035 in. in diam., depressed-globular, almost sessile, often with a few bracteoles at the base. *Calyx* rotate, with 5 deep broad rounded membranous pubescent lobes. *Petals* 5, broadly ovate to rotund, longer than the calyx, glabrous, concave. *Staminal tube* shorter than the petals, cupular, sub-entire, glabrous; *anthers* 5, ovate, curved, exserted. *Ovary* small, much depressed; *stigma* depressed-spheroidal, vertically grooved. *Fruit* ovoid or ovoid-globose, tapering at the base into a short pseudo-stalk, densely covered with minute scaly tawny tomentum, 1 in. long, and ·75 in. in diam.

Perak: King's Collector, Nos. 5901 and 7104. DISTRIBUTION: Sumatra; Forbes, No. 1679.

This resembles *A. tenuicaulis*, Hiern; but it has smaller flowers, different calyx and staminal tube and larger fruit. The texture of the leaflets is also thinner and the stellate hairs on their under surface less numerous.

23. AGLAIA TENUICAULIS, Hiern in Hook. fil. Fl. Br. Ind. I, 556. A shrub or small tree 10 or 12 feet high with a slender stem 2 to 3 in. in diam. *Leaves* 3 feet or more in length, unequally pinnate; the long petiole, rachises, petiolules and young branches densely stellate rusty-tomentose; leaflets membranous, oblong to elliptic, minutely cuspidate to shortly acuminate; the base cuneate, rarely rounded; upper surface glabrous, the lower sparsely minutely stellately rufous-pubescent; main nerves 15 to 20 pairs, spreading, obsolete on the upper prominent on the lower surface; length 6 to 12 in., breadth 2·5 to 4·5 in.; petiolules ·3 to ·35 in., stout. *Panicles* slightly supra-axillary, everywhere densely rufous-pubescent like the petioles, about 12 in. long, with spreading densely-flowered branches, those bearing fruit only a few inches long. *Flowers* ·05 in. long, globular, on pedicels longer than themselves. *Calyx* cupular, stellate-pubescent outside, glabrous inside, with 5 deep acute spreading teeth. *Petals* 5, much longer than the calyx, ovate or sub-obovate, concave, elliptic, glabrous. *Staminal tube* shorter than the petals, globular, inflated about the middle of the sub-entire mouth, glabrous except at the base inside; *anthers* 5, short, ovate, included. *Ovary*

small, stellate-hairy. *Stigma* elliptic, obtuse. *Fruit* obovoid, rugulose, densely covered with minute rusty stellate-tomentum, about ·4 in. long, C. DC. in Monogr. Phaner. I, 615.

Penang: Maingay (Kew Distrib.), No. 3252. Curtis, No. 747. Selangor; Ridley. Perak; Wray, King's Collector, Scortechini. Singapore; Lobb. DISTRIB. Sumatra.

24. AGLAIA TRICHOSTEMON, C. DC. Monogr. Phaner. I, 608. A tree 30 to 60 feet high; young shoots, petioles and rachises of leaves and inflorescences deciduously rusty stellate-tomentose, scabroid beneath the tomentum. *Leaves* 18 to 27 in. long, unequally pinnate; leaflets 9 to 13, alternate or opposite, sub-coriaceous, oblong to elliptic, shortly acuminate, the base slightly cuneate or rounded; upper surface glabrous, the lower sparsely and minutely stellately pubescent; main nerves 12 to 16 pairs, slightly depressed on the upper surface when dry, bold on the lower; length 4 to 8 in.; breadth 2 to 2·75 in.; petiolules ·25 to ·4 in. *Panicles* supra-axillary, solitary, nearly as long as the leaves, with few divaricating lax branches, densely and minutely rusty stellulate-pubescent and scaly. *Flowers* obovoid, globose, ·06 in. long, on pubescent pedicels shorter than themselves. *Calyx* shallow, cupular, deeply divided into 5 rotund, blunt, spreading lobes, pubescent externally. *Petals* 5, slightly unequal, ovate-rotund, concave, glabrous, much longer than the calyx. *Staminal tube* shorter than the petals, thin, puberulous, obovate, the mouth with 5 broad emarginate shallow teeth; *anthers* 5, broadly ovate, small, inserted near the edge of the tube, included. *Disc* rather large, inferior to the ovary, pubescent. *Ovary* small, cylindric, 4-angled, glabrous. *Fruit* globular to ovoid, shortly pedicelled, densely covered with minute rusty stellate tomentum, ·4 to ·6 in. long. *Cupania rufescens*, Wall. Cat. 8067 *B* (exclude A). *Aglaia edulis*, Hiern in Hook. fil. Fl. Br. Ind. I, 1556. *Aglaia cupanioidea*, King MSS.

Penang; Wallich. Perak; Scortechini, King's Collector, Nos. 5597, 5901. Pahang; Ridley, No. 5885. Singapore, Anderson, No. 29; Ridley, No. 5833. Malacca; Derry, Nos. 1076, 1186. DISTRIBUTION Borneo, Beccari, No. 3981.

Although first collected so long ago as Wallich's time, fruit of this very distinct species is now described for the first time. It resembles *A. tenuicaulis* and *A. membranifolia* to some extent in its leaves, but is a much larger tree than either, and its leaflets have a thicker texture. Its fruits are much smaller than those of *A. membranifolia*; and, although of about the same size as those of *A. tenuicaulis*, they are covered with much shorter tomentum. Specimens of this were distributed from the Calcutta Herbarium under the MSS. name *Aglaia cupanioidea*, King MSS.

25. AGLAIA MACROSTIGMA, King, n. sp. A tree 40 to 60 feet high; young branches very stout, lenticellate, puberulous. *Leaves* 2·5 to 4 feet long, unequally pinnate, the petioles very long, ·3 in. thick, and, like the rachises petiolules and inflorescence, covered with minute brown scales; leaflets 15 to 17, the pairs opposite or nearly so, membranous, elliptic to elliptic-oblong, slightly oblique, shortly and sharply acuminate, the base rounded; upper surface everywhere glabrous, the lower glabrous, the midrib and nerves rugulose and minutely scaly: main nerves 12 to 20 pairs, depressed on the upper surface, very prominent on the lower; length 5 to 10 in., breadth 2 to 4 in., petiolules ·5 to ·7 in. *Panicles* axillary, solitary, about 12 in. long (including the long peduncle), the branches rather short, many-flowered. *Flowers* broadly obovoid, about ·08 in. long, on short stout rusty-tomentose pedicels. *Calyx* half as long as the corolla, cup-shaped, the mouth with 4 unequal broad valvate teeth, rusty-stellate-tomentose externally. *Petals* 5, glabrous, imbricate, the two external longer and orbicular, the 3 inner smaller and elliptic. *Staminal tube* shorter than the petals, cupular, the mouth wide and with 8 to 10 lanceolate teeth; *anthers* 7 or 8, large, elliptic, much exserted. *Ovary* depressed, 3 angled, 3-celled, yellowish-pubescent, crowned by a glabrous erect fleshy deeply-fluted 3-angled stigma. *Fruit* elliptic-obovoid, narrowed to a short pseudo-stalk, covered with minute pale scales, 1·5 in. long, and 1 in. in diam.

Perak: King's Collector, Nos. 6531, 6919, 7559.

Like *A. heteroclita*, King, this species has more than 5 stamens, and it has a larger stigma than is usually found in *Aglaia*. Its inflorescence is quite that of *Aglaia*, as also is its fruit.

26. AGLAIA HETEROCLITA, King, n. sp. A tree 30 to 40 feet high, glabrous except the inflorescence and under surfaces of the leaves. *Leaves* 18 to 30 in. long, equally or unequally pinnate: leaflets thinly coriaceous, 8 or 9 to 10 or 11, distant, alternate, oblong to elliptic-oblong, oblique, more or less acuminate, the base cuneate and oblique: both surfaces dull and pale when dry (especially the lower), the upper glabrous, the lower with sparse minute rusty stellate scales; main nerves 12 to 16 pairs, spreading, faint on the upper, and only slightly conspicuous on the lower surface; length 4 to 7 in., breadth 1·5 to 2·75 in.; petiolules ·35 to ·75 in., slender. *Panicles* axillary or terminal, 2·5 to 6 in. long, stout, the branches not divaricating, the ultimate branchlets minutely bracteolate, densely flowered. *Flowers* ·125 in. long, sub-globular, on thick pedicels shorter than themselves and with a spongy epidermis. *Calyx* fleshy, corrugated, conspicuously pellucid-dotted, deeply divided into 5 broad rounded imbricated concave lobes. *Petals* 5, somewhat longer than the calyx and thinner, not dotted, ellip-

tic, blunt, concave especially towards the apex. *Staminal tube* shorter than the petals and darker in colour, globular-cylindric, the mouth obscurely lobed. *Anthers* 7 or 8, elliptic, included. *Ovary* pyramidal, fleshy, grooved, pubescent, 2-celled, crowned by the glabrous, broadly and shortly cylindric, grooved, indistinctly 2-lobed stigma. *Ovules* 2 in each cell, superposed. *Fruit* obovoid or pyriform, shortly apiculate, minutely scaly-tomentose, about 1 in. long including the pseudo-stalk, and ·8 in. in diam., apparently indehiscent, 1- or 2-seeded.

Perak; King's Collector, No. 10896, Wray (at elevation of 3400 ft.), Nos. 1135, 3994. DISTRIB. Sumatra, Forbes, Nos. 1558 and 1696.

This differs from typical *Aglaia* in having 7 or 8 stamens, and its stigma is that of *Amoora* rather than of *Aglaia*. The inflorescence resembles that of *Aglaia argentea*, Bl.

27. AGLAIA ANDAMANICA, Hiern in Hook. fil. Fl. Br. Ind. I, 218. A tree 30 to 40 feet high; young branches, petioles, midribs, inflorescence and calyx covered with pale-brownish deciduous scales. *Leaves* 12 to 15 in. long, unequally pinnate; leaflets 5 to 7, alternate, membranous, ovate-elliptic to elliptic, shortly and obtusely acuminate, the base rounded or sub-cuneate, slightly oblique; main nerves 13 to 15 pairs, faint; upper surface glabrous, shining; the lower dull, sparsely scaly; main nerves 13 to 16 pairs, oblique, slightly prominent below; length 4 to 6 in., breadth 2 to 3 in., petiolule ·25 to ·35 in. *Panicles* crowded towards the ends of the branches, axillary, solitary, 2 to 3 in. long, many-flowered. *Flowers* broadly ovoid, truncate, ·15 in. long, on pedicels shorter than themselves. *Calyx* cupular, puberulous and scaly outside, the mouth with 5 pointed minute erect teeth. *Petals* 5, larger than the calyx, elliptic, slightly obovate, the apex blunt and incurved, puberulous externally, the edges membranous and glabrous. *Staminal tube* ovoid-globose, the apex sub-truncate, with 4 obscure broad teeth; *anthers* 8 or 9, narrowly elliptic, sessile, inserted at the base of the tube, included. *Ovary* small, depressed, 3-angled, densely tawny-tomentose; *stigma* sub-capitate, glabrous, fleshy, 2–3-angled. *Fruit* narrowly ellipsoid, lepidote, 1·5 in. long. Kurz For. Flora Burma. I, 218. C. DC. Monogr. Phaner. I, 606. *Amoora dysoxyloides*, Kurz Journ. As. Soc. Bengal II, 1875, p. 200; I, 222. C. DC. l. c. I, 589.

The Andaman and Nicobar Islands; Kurz, King's Collectors. DISTRIB. Great Coco Island, Prain. Burma, Brandis.

Kurz described his *Amoora dysoxyloides* on scanty specimens collected by Sir Dietrich Brandis in Burma. I have carefully dissected flowers from these and I find they are those of an *Aglaia*, and belong to *A. andamanica*, Hiern.

28. AGLAIA MAINGAYI, King, n. sp. A shrub? young branches, thin,

with pale bark and minute brown scales. *Leaves* 4 to 6 in. long; *leaflets* 4 or 5, alternate or opposite, membranous, oblong-elliptic, shortly and bluntly acuminate, the base cuneate, both surfaces glabrous; main nerves 6 to 9 pairs, ascending, faint; length 2·5 to 3·5 in.; breadth 1·15 to 1·5 in., petiolule ·25 in. *Panicles* one or two from an axil, shorter than the leaves, slender, much branched, scaly. *Flowers* on pedicels as long as themselves, depressed-globular, ·15 in. in diam. *Calyx* widely cupular, pubescent and scaly outside, with 4 or 5 broad shallow erect unequal teeth. *Petals* 4 or 5, larger than the calyx, obovate, the upper half concave, glabrous or puberulous, attached by their bases to the staminal tube. *Staminal tube* depressed-globose, the mouth wide and obscurely toothed, puberulous below the anthers inside; *anthers* 10, half as long as the tube, ovate, included. *Ovary* minute, depressed, pubescent, 3-celled, 3-ovuled; *stigma* short, cylindric, glabrous. *Fruit* (young) broadly obovoid, deeply 3-grooved, puberulous, 3-celled, with a single seed in each cell. *Aglaia Maingayi*, Hiern in Hook. fil. Fl. Br. Ind. I, 562. C. DC. Monogr. Phaner. I, 588.

Malacca: Maingay (Kew Distrib.), No. 342 (Herb. prop. No. 1910). Perak: King's Collector, No. 3325, Scortechini.

Doubtful Species.

A tree has been collected in Perak both by Mr. Wray and Mr. Kunstler (Collector of the Calcutta Botanic Garden), which I believe to be *Aglaia Korthalsii*, Miq. The Perak specimens are in fruit only; and it is only by comparison with Miquel's type specimen of *A. Korthalsii* in the Leiden Herbarium (which is in flower only), that I have made the identification. The species closely resembles *A. macrostigma*, King, but has shorter leaves with more slender rachises and petiolules: the fruit is also larger and more obovoid. I have distributed the Perak plant as doubtfully *A. Korthalsii*, but not having flowers, I do not describe it here.

8. LANSIUM, Rumph.

Trees with unequally pinnate leaves; the leaflets quite entire, alternate or opposite, shortly petiolulate. *Flowers* polygamo-diœcious, 5-merous, axillary, the male usually paniculate, the female spicate-racemose. *Sepals* rounded, imbricated. *Petals* rounded, connivent, concave, imbricated. *Staminal tube* globose, the mouth entire or crenulated; *anthers* 10, obtuse, usually in two rows, the shorter ones included, the longer partly exserted, sometimes apiculate. *Disk* obsolete. *Ovary* globose, 3–5-celled; cells 1-2-ovuled; *style* very short, thick; *stigma* truncate, 3–5-lobed. *Fruit* baccate, edible, 1–5-celled, *cells*

1-2-seeded; *seeds* oblong, invested in a pulpy aril, exalbuminous.—DISTRIB. Four species, all Indo-Malayan.

Leaflets 5 to 10 in. long; main nerves about 10 pairs ... ... 1. *L. domesticum.*
Leaflets 2 to 3 in. long: main nerves very numerous . ... 2. *L cinereum.*
Doubtful species ... ... 3. *L. pedicellatum.*

1. LANSIUM DOMESTICUM, Jack in Trans. Linn. Soc. XIV, 115, t. IV. f. 1. A tree 30 to 50 feet high; young branches with pale glabrous lenticellate bark. *Leaves* 12 to 18 in. long; leaflets 5 to 7, alternate, coriaceous, oblong-elliptic, sometimes slightly obovate, abruptly shortly and obtusely acuminate, narrowed and slightly unequal at the base; both surfaces shining, reticulate, glabrous or slightly puberulous toward the base; main nerves about 10 pairs, ascending, curved, depressed on the upper, prominent on the lower surface when dry; length 5 to 10 in., breadth 2·75 to 4 in., petiolules ·5 in.; the terminal 1 in., jointed. *Hermaphrodite spikes* from the trunk and larger branches, solitary or in fascicles, pubescent, much shorter than the leaves. *Flowers* sessile or on very short pubescent pedicels, solitary, minutely bracteolate at the base. *Calyx* fleshy, puberulous, with 5 shallow rounded teeth. *Petals* longer than the calyx, sub-rotund, glabrous. *Staminal tube* sub-globose, the mouth sub-entire, truncate, shorter than the petals, the stamens in a single row. *Ovary* sub-globular, tomentose, 5-celled; *style* short, thick, 10-furrowed; *stigma* large, discoid. *Berry* oblong-ovate to obovoid, sub-tomentose, 1 to 1·5 in. long; *seeds* usually about 2, embedded in much transparent pulp. Correa de Serra in Ann. Mus. X, 157, t. 7, fig. 1; Blume Bijdr. 165; A. Juss. Mem. Mel. 81; Miq. Fl. Ind. Bat. Vol. I, Pt. 2, 545; Hiern in Hook. fil. Fl. Br. Ind. I, 558; C. De Cand. Monogr. Phaner. I, 598.

Malacca: Griffith, Maingay (Kew Distrib.), No. 338. Perak: Wray, King's Collector, common. Cultivated in all the Provinces, except the Andamans and Nicobars, on account of its edible fruit. DISTRIB. The Malayan Archipelago.

There are several varieties of this which have been by some authors regarded as species, *e.g.*, *L. aqueum*, Jack, *L. humile*, Hassk.

2. LANSI[illegible] CINEREUM, Hiern in Hook. fil. Fl. Br. Ind. I, 558. A tree; young branches tawny-pubescent at first, afterwards cinereous. *Leaves* 3 to 5 in. long, unequally pinnate; leaflets 3 to 5, opposite, sub-coriaceous, elliptic-oblong, obtusely cuspidate, the base acute; both surfaces quite glabrous, pale when dry; main nerves very numerous, obscure; length 2 to 3 in., breadth ·8 to 1·5 in., petiolules ·1 to ·25 in. *Spikes* nearly as long as the leaves, glabrous. *Flowers* hermaphrodite.

Calyx cupular, puberulous, with 5 obscure rounded teeth. *Petals* obovate, glabrous. *Anthers* oblong, mucronate. *Ovary* globose, pubescent, 5-celled, longer than the glabrous style. *Fruit* unknown. C. DC. Monogr. Phaner. I, 598.

Malacca: Maingay (Kew Distrib.), No. 339.

Known only by Maingay's scanty specimens.

3. LANSIUM PEDICELLATUM, Hiern in Hook. fil. Fl. Br. Ind. I, 558. A tree; young branches pale brown, scaly. *Leaves* 9 to 12 in. long, unequally pinnate; leaflets 3 to 5, alternate or sub-opposite, thinly coriaceous, elliptic, shortly and sharply acuminate; the base oblique, obtuse or cuneate; both surfaces glabrous; main nerves 8 to 10 pairs, ascending, spreading, slightly prominent beneath; length 3 to 6 in., breadth 1·5 to 2·5 in., petiolules ·15 to ·25 in. *Male flowers and inflorescence* unknown. *Racemes of female flowers* 1 to 2 in. long, axillary, sometimes with a branch at the base; flowers on pedicels ·1 to ·15 in. long. *Ovary* minutely tomentose, 4-celled; *stigma* sessile. *Young fruit* sub-globose, fleshy, shortly tomentose.

Malacca: Maingay (Kew Distrib.), No. 356.

The above description is drawn up from the only two specimens which I have seen, and from Hiern's and De Candolle's descriptions. There is nothing in it to connect the species absolutely with *Lansium*, the genus in which its author has placed it.

9. WALSURA, Roxb.

Trees. *Leaves* 1–9-foliolate; leaflets opposite, entire, pale beneath. *Panicles* axillary and terminal; *Flowers* small, hermaphrodite. *Calyx* short, 5-fid or -partite, the lobes spreading, imbricated in bud. *Petals* 5, ovate-oblong, spreading, slightly imbricated or sub-valvate. *Filaments* 10 or 8, linear or flattened, free or connate in a tube; *anthers* terminal or inserted in the notch at the apex of the filament. *Disk* usually annular, fleshy. *Ovary* short, 2–3-celled, imbedded in the disk, style rather short; *stigma* turbinate-capitate, 2-3-dentate; *Ovules* 2 in each cell. *Fruit* baccate, shortly tomentose, indehiscent, 1- rarely 2-celled and -seeded; *seed* inclosed in a fleshy aril, exalbuminous. DISTRIB. about 12 species, Indo-Malayan.

Filaments united near the base.
  Leaflets 5 to 9, with 5 or 6 pairs of main lateral nerves ... ... 1. *W. multijuga.*
  Leaflets not more than 5, with 8 to 10 pairs of main lateral nerves.
    Stigma discoid, fruit not apiculate 2. *W. neurodes.*

Stigma conical, with a large swollen annulus round its base; fruit apiculate ... ... 3. *W. Candollei.*

Filaments quite free.

Leaflets five, 5 to 7 in. long, glaucous beneath, flowers ·15 in. long ... 4. *W. hypoleuca.*

Leaflets three to five, 3 to 5 in. long, not glaucous; flowers ·25 in. long .. 5. *W. robusta.*

1. WALSURA MULTIJUGA, King n. sp. A tree 20 to 30 feet high: young branches cinereous, puberulous, not lenticellate. *Leaves* 5 to 9 in. long, rachis puberulous; leaflets 5 to 9, coriaceous, lanceolate or oblong-lanceolate, shortly acuminate, usually much narrowed but sometimes rounded and oblique at the base; both surfaces glabrous, the lower paler; main nerves 5 or 6 pairs, ascending, curved, slightly prominent on the lower surface: length 2·5 to 5 in., breadth ·75 to 1·5 in., rarely 2 in., petiolules ·15 to ·2 in., the terminal ·4 or ·5 in. *Panicles* small, umbellate-cymose, pedunculate, much shorter than the leaves, clustered in the axils of the leaves or terminal, puberulous; the peduncles 1 to 2 in. long, the heads about 1 in. in diam. *Flowers* about ·1 in. long, their pedicels shorter. *Calyx-teeth* short, broad, spreading. *Petals* 5, broadly elliptic, blunt, puberulous outside, longer than the calyx. *Stamens* 10, shorter than the petals; the filaments slightly united into a tube in the lower third, the upper two-thirds free, flattened, bifid at the apex, glabrous outside, pubescent inside below the anthers. *Anthers* small, ovate, inserted between the divaricating incurved teeth of the filaments. *Disc* proper, none. *Ovary* broadly obovoid or ovoid-globular, tapering into the very short style, glabrous; *stigma* small, capitate with a central mammilla. *Fruit* ovoid or ovoid-globose, apiculate, densely rusty-tomentose, ·5 in. long without the apiculus. *Melospermum rubro-stamineum*, Scort. MS. in Herb. Calc.

Perak: Scortechini, Wray, King's Collector, very common. DISTRIB. Sumatra, Upper Burma.

2. WALSURA NEURODES, Hiern in Hook. fil. Fl. Br. Ind. I, 564. A tree; young branches cinereous-puberulous. *Leaves* 6 to 8 in. long; leaflets 5, narrowly elliptic or elliptic-oblong, shortly and bluntly acuminate, the base cuneate or rounded; upper surface glabrous, shining, the lower glaucous; main nerves 8 to 10 pairs, spreading, rather prominent beneath; length 2 to 4 in., breadth 1 to 2 in., petiolule ·25 to ·35 in., the terminal one 1 in. *Panicles* equal to or longer than the leaves, on rather long peduncles, their lateral branches lax, short, the flowers near their apices and not numerous. *Flowers* ·15 in. long, pedicels shorter. *Calyx* with 5 short broad ovate spreading teeth. *Petals*

5, broadly elliptic, blunt, glabrescent inside, puberulous outside. *Stamens* 10, shorter than the petals; the filaments flattened, pubescent, faintly united in their lower third but easily separable, inserted outside the annular entire glabrous disc. *Ovary* pubescent, surrounded by the disc, ovoid-conic, tapering into the thick glabrous style; *stigma* discoid, small. *Fruit* ovoid or ovoid-rotund, minutely puberulous, not apiculate, about ·65 in. long. C. DC. Monogr. Phaner. I, 636.

Malacca: Maingay (Kew Distrib.), Nos. 344 and 345. Griffith, No. 1057 (Kew Distrib.). Perak: Wray, No. 3798.

3. WALSURA CANDOLLEI, King, n. sp. A small tree; young branches glabrous, lenticellate, dark-coloured when dry. *Leaves* 4 to 7 in. long, unequally pinnate; leaflets usually 5, membranous, lanceolate, sub-acute, the base rounded; both surfaces glabrous, the lower pale, sub-glaucous; main nerves 7 to 11 pairs, spreading, curving; length 2 to 4 in., breadth ·75 to 1·2 in., petiolules ·2 to ·4 in. *Panicles* puberulous, crowded towards the ends of the branches, axillary, on slender pedicels 2 to 3 in. long, corymbosely cymose, about 1·5 in. across. *Flowers* ·1 in. long, sub-globular, on pedicels about as long as themselves. *Calyx* of 5, free ovate concave spreading sepals, pubescent externally. *Petals* 5, much larger than the sepals, elliptic-ovate, sub-acute, puberulous. *Stamens* 10, the filaments united into a tube in their lower third, pubescent, the alternate shorter, all inserted outside the thick glabrous annular disc. *Anthers* attached to the apices of the filaments, broadly ovate, short, sparsely pubescent. *Ovary* pubescent, conical, surrounded by the disc. *Style* short, ob-conical; *stigma* conical, surrounded at the base by a projecting fleshy annulus. *Fruit* ovoid-globose, with a slightly curved conical apiculus, densely but minutely rusty-puberulous, ·75 in. long.

Andaman Islands; Kurz, King's Collector.

This species is allied to *W. neurodes*, Hiern, from which it differs in its more hairy petals and stamens, thicker style, more conical stigma and apiculate fruit. I dedicate the species to M. Casimir De Candolle, who first detected it as new from fragmentary specimens sent to him by the late Mr. Kurz. M. De Candolle did not include it in his Monograph of *Meliaceæ* (Monogr. Phaner. Vol. I), but kindly communicated the fact of his discovery to me. Specimens since sent to me by the collectors of the Calcutta garden confirm the accuracy of his decision.

4. WALSURA HYPOLEUCA, Kurz Rep. Veg. Andam. ed. 2, p. 33. A tree 40 to 50 feet high; young branches stout, puberulous, lenticellate. *Leaves* 12 to 14 in. long, glabrous; leaflets 5, thinly coriaceous, elliptic-oblong, sub-acute, the base cuneate; upper surface shining, the lower glaucous; main nerves 7 or 8 pairs, ascending, prominent beneath;

length 5 to 7 in., breadth 2 to 3 in., the terminal one a third larger and with more nerves; petiolules ·75 in., that of the terminal leaflet 2 in. *Panicles* several from an axil, 4 to 6 in. long, pubescent, the branchlets short and slender with the flowers crowded near their apices. *Flowers* ·15 in. long, on short puberulous pedicels. *Calyx-teeth* 5 or 6, elongate, ovate or lanceolate, puberulous. *Petals* 5, longer than the calyx, elliptic-obtuse, erect, puberulous. *Stamens* 10, distinct, inserted outside the disc, shorter than the petals; the filaments flattened, but not quite so broad as the ovate anthers, sparsely villous. *Disc* annular, cushion-like, entire, glabrous, surrounding the ovoid-conic, villous, ovary. *Style* cylindric, thickened upwards, glabrous; *stigma* discoid. Unripe *fruit* (*fide* Kurz) "oblong, acuminate, greyish-velvetty." Kurz in Journ. As. Soc. Bengal, Vol. 41, Pt. 2, p. 296; For. Flora Burma I, 224; Hiern in Hook. fil. Fl. Br. Ind. I, 564. C. D. Cand. Monogr. Phaner. I, 639.

Andaman Islands: at Port Mowat.

This has been collected only by Kurz and I have never seen its fruit. I believe Kurz's species *C. oxycarpa* is merely a small-leaved form of this. Kurz distinguishes it from this by its thinner leaves and fainter venation,—characters of little value, I fear.

5. Walsura robusta, Roxb. Hort. Beng. 32: Fl. Ind. II, 386. A tree 40 to 60 feet high; young branches slender, lenticellate, glabrous. *Leaves* 7 to 12 in. long. *Leaflets* 3 to 5, sub-coriaceous, ovate-oblong to ovate, entire, bluntly acuminate, the base narrowed; both surfaces glabrous, the upper shining, the lower dull with the 6 or 7 pairs of curving nerves rather prominent; length 3 to 5 in., breadth 1·75 to 2·25 in.; petiolules about ·5 in., that of the terminal leaflet 1·5 in. *Panicles* dense, many-flowered, shorter than the leaves, cinereous-puberulous; bracts (if any) deciduous. *Flower-buds* hemispheric, tomentose, subsessile. *Petals* ·2 in. long (larger than the sepals). *Stamens* 10; the filaments flattened, lanceolate, puberulous, free from each other, inserted outside the broad, thin, sub-concave, pubescent disk. *Ovary* depressed-globose, crowned by the thick style, 2-celled, with 2 ovules in each cell; *stigma* discoid with a central mammilla. *Fruit* elliptic or globular, ·75 in. in diam., when dry capsular, 2-celled, but one of the cells empty. *Seed* pendulous, testa membranous, albumen 0; the cotyledons fleshy, plano-convex; the radicle short, superior. Hiern in Hook. fil. Fl. Br. Ind. I, 565: Kurz For. Fl. Burm. I, 223; C. De. Cand. Monogr. Phaner. I, 638; Wall. Cat. 1266, 8110, 8111, 8112. *Surwala robusta, Roem. Synops.* i. 108. *Monocyclis robusta, Wall. ex Voigt Hort. Suburb. Calcutta* 135. *Scytalia glabra, Hb. Ham. ex Wall. Cat.* 8048 E, (*not the other letters.*)

Andaman Islands: very common. DISTRIB. Brit. India, in Burma, Silhet, Assam, Sikhim.

10. HEYNEA, Roxb.

Trees or rarely shrubs. *Leaves* 5–11-foliolate; leaflets opposite, entire. *Panicles* terminal and axillary, corymbose, long-peduncled; *Flowers* rather small, hermaphrodite. *Calyx* short, 4–5-fid, the lobes imbricate. *Petals* 4–5, oblong, suberect, sub-imbricate. *Staminal tube* 8- or 10-fid; lobes linear, bidentate at apex, bearing the anthers between the linear teeth. *Disk* annular, fleshy. *Ovary* immersed in the disk, 2-3-celled, narrowing into the short style; *stigma* 2–3-dentate, with a thickened ring at the base; *ovules* 2 in each cell. *Fruit* capsular, 1-celled, 2-valved, 1-seeded, glabrous. *Seed* arillate, exalbuminous; aril thin, white; cotyledons hemispherical.—DISTRIB. 1–3 species, limited to Indo-Malaya.

HEYNEA TRIJUGA, Roxb., Hort. Beng. 33. A small tree 15 to 20 feet high. *Leaves* 6 to 16 in. long; leaflets broadly ovate to ovate-lanceolate, shortly acuminate, the base rounded or cuneate; upper surface glabrous, the lower surface glaucous, glabrous or pubescent; the 6 to 8 pairs of curving spreading nerves slightly prominent; length 2·5 to 5·5 in., breadth ·8 to 2·75 in., petiolule ·15 to ·45 in., the terminal ones longer. *Panicles* glabrous as long or nearly as long as the leaves, on long peduncles, with numerous corymbose branches. *Flowers* ·15 in. long. *Petals* much longer than the calyx, their midribs thick, their edges membranous. *Staminal tube* wide. *Ovary* glabrous. *Fruit* ovoid, beaked; the pericarp somewhat fleshy, smooth, splitting by 2 rarely 3 valves. Roxb. in Bot. Mag. t. 1738; Corom. Plants III, 260; Flor. Ind. II, 390; Grah. Cat. Bomb. Pl. 31; Adr. Juss. in Mem. Mus. xix. t. 18, f. 17; Dalz. & Gibs. Bomb. Fl. 38; Wall. Cat. 1258; Brandis For. Fl. 70. DC. Prod. I, 624; Monogr. Phaner. I, 713: Hiern in Hook. fil. Fl. Br. Ind. I, 565. *H. affinis*, Adr. Juss. l.c. 275; Beddome Fl. Sylvat. t. 134; W. & A. Prodr. i. 121. *Walsura (Heynea) pubescens*, Kurz in Journ. Asiat. Soc. Beng. xli. ii. 297. *Walsura trijuga* Kurz For. Fl. Burm. I, 225. *H. connaroides*, Wight ex Voigt Hort. Suburb. Calcutta 136.

Perak: common, and probably also in the other provinces.—DISTRIB. British India, Sumatra.

Var. *multijuga*. DC. Monogr. Phaner. I, 714. Leaflets 11, lanceolate. *H. quinquejuga*, Roxb. Hort. Calc. 90; Fl. Ind. II, 391. Wall. Cat. 1259. *H. Sumatrana*, Miq. Ann. Mus. Lugd. Bat. IV, 60; DC. Monogr. Phaner. I, 714.

Penang: Wallich, No. 1259. Curtis, No. 676.

11. CARAPA, Aubl.

Glabrous littoral trees. *Leaves* 2- or 4- or sometimes 6-foliolate; leaflets opposite, quite entire, the nerves faint. *Panicles* lax, axillary, cymose, flowers hermaphrodite. *Calyx* 4-fid, short. *Petals* 4, reflexed. *Staminal tube* urceolate-globose, 8-dentate, the teeth bi-partite: *anthers* 8, 2-celled, included, alternating with the teeth. *Disk* fleshy, cup-shaped, adherent to the base of the ovary. *Ovary* 4-celled, 4-sulcate, the *cells* 2–8-ovuled; *style* short, *stigma* discoid. *Fruit* capsular, sub-globose, large, 4-celled, 6–12-seeded; pericarp fleshy, dehiscing by 4 valves. *Seeds* large, thick, angular; testa hard, spongy, aril 0, hilum large, ventral; cotyledons amygdaloid.—DISTRIB. About 6 species, all tropical and usually littoral.

Leaves with broad blunt apex and narrow base, coriaceous; panicles stout; fruit as large as an orange ... ... 1. *C. obovata.*

Leaves with sub-acute apex and broad base, very thinly coriaceous; panicles slender: fruit 7 to 10 in. in diam. ... ... 2. *C. moluccensis.*

1. CARAPA OBOVATA, Blume Bijdr. 179. *Leaves* 3 to 6 in. long; leaflets 1 to 2 pairs, coriaceous, obovate to oblong, the apex broad, obtuse, rarely notched or sub-acute, the base narrowed; main nerves 6 to 9 pairs, length 3 to 4 in., breadth 1·35 to 1·75 in., petiolules ·2 to ·35 in. *Panicles* 1·5 to 2·5 in. long, stout, cymose, few-flowered. *Flowers* ·25 in. long, their pedicels ·3 to ·5 in. long, bracteolate. *Calyx-teeth* broad, rounded. *Petals* much longer than the calyx, broadly elliptic, the edges imbricate. *Ovary* broadly ovoid. *Fruit* the size of an orange, apiculate when young, but not when ripe. C. DC. Monogr. Phaner. I, 718: Seemann Flora Vitiensis p. 38. *C. moluccensis*, Kurz (not of Lamk. For. Flor. Br. Burma, I, 226: *C. moluccensis*, (in part,) Hiern in Hook. fil. Fl. Br. Ind. I. 567. *Xylocarpus obovatus*, A Juss. Mem. Mel. p. 92; Miq. Fl. Ind. Bat. I, Pt. 2, p. 546.

Malacca: Maingay, (Kew Distrib.) No. 347; Griffith, No. 1098. Perak; Scortechini, King's Collector. South Andaman; Kurz, King's Collectors. Little Andaman: Prain. DISTRIB. Sunderbuns of Bengal: (Heinig) and others; Java and other islands of the Malayan Archipelago. Tropical Africa.

2. CARAPA MOLUCCENSIS, Lamk. Encyc. Meth I, 621. *Leaves* 4 to 10 in. long; leaflets usually 2 pairs, thinly coriaceous, almost membranous, broadly ovate to ovate- oblong, sub-acute, the base broad, unequal; main nerves about 6 pairs, spreading; length 2 to 4 in., breadth 1·5 to 2·35 in., petiolules ·15 to ·25 in. *Panicles* 3 to 5 in. long, slender, with lax spreading few-flowered branches. *Flowers* as in the last, but

with rather broader petals and a shorter style. *Fruit* sub-globular, 7 to 10 in. in diam. Blume Bijdragen, 179; C. DC. Monogr. Phaner, I, 719: Don. Gen. Syst. I, 686; DC. Prod. I, 626: Bedd. Flor. Sylvat. t. 136: Seeman Flor. Viti, 38; Hiern in Hook. fil. Fl. Br. Ind., (*in part,*) I. 567. *C. indica*, A. Juss. Dict. Sc. Nat. VII, p. 31. *Xylocarpus granatum*, Willd. Spec. III, 328; A. Juss. Mem. Mel. p. 92, t. 20, No. 22; Roxb. Fl. Ind. II, 240: Wight and Arn. Prod. 121; Blanco Flor. Philipp. ed. 2, p. 207; A. Gray U. S. Exped. I, 243. *X. granatum*, Koenig, Miq. Fl. Ind. Bat. I, Pt. 2, p. 546: *X. Forstenii* Miq. Ann. Mus. Lugd. Bat IV, 62.

South Andaman Island; Kurz, King's Collectors. Great Coco Island; Prain. DISTRIB. Burma, Malayan Archipelago, S. India, Fiji Islands, Africa.

12. CHICKRASSIA, Adr. Juss.

A tree with pari-pinnate leaves, alternate sub-opposite or opposite oblique entire leaflets, terminal panicles and 4-5-merous flowers. *Calyx* short, dentate. *Petals* oblong, free, imbricate, erect. *Staminal tube* cylindric; its mouth with 10 short blunt teeth. *Anthers* 10, short, attached to the edge of the mouth and entirely exserted. *Disk* none. *Ovary* cylindric, on a short stalk, 3-celled; the ovules numerous, in 2 rows in each cell; *style* very short, stout; *stigma* capitate. *Capsule* woody, 3-celled, loculicidal; the pericarp separating into two layers. *Seeds* numerous, flat, winged below, exalbuminous. A single species.

CHICKRASSIA TABULARIS, A. Juss. in Mém. Mus. XIX, 251, t. 22, f. 27. A tall tree; young branches stout, lenticellate, sub-glabrous. *Leaves* 12 to 18 in. long; leaflets 10 to 16, ovate to oblong, unequal-sided, acute or acuminate; the base rounded on one side, narrowed on the other: upper surface glabrous, the lower glabrous or more or less velvetty; length 2 to 5 in., breadth 1 to 2·5 in., petiolules ·15 to ·35 in. *Panicles* terminal, erect, shorter than the leaves; the branches spreading, pubescent, many-flowered. *Flowers* ·4 to ·5 in. long. *Calyx* with 5 short, shallow, broad teeth, pubescent outside. *Petals* puberulous outside, pubescent inside. *Capsule* ovoid, 1·75 in. long; seeds ·65 in. long. W. and A. Prod. 123; Thwaites Enum. 61; Wight Ill. t. 56; Bedd. Fl. Sylvat. t. 9; Grah. Cat. Bomb. Pl. 32; Kurz For. Flora Burm. I, 227; Hiern in Hook. fil. Fl. Br. Ind. I, 568; C. DC. Monogr. Phaner. I, 726. *Swietenia Chickrassia*, Roxb. Hort. Beng. 33; Fl. Ind. II, 399. *Plageotaxis Chickrassia*, Wall. Cat. 1269. *S. Sotrophola*, Ham. ex Wall. Cat. p. 214. *Chickrassia triloculuris* Roem. Syn. I, 135; Roxb. ex Buch. Journ. I, 184; G. Don. Gen. Syst. I, 688. *Cedrelae* sp. Wall. Cat. 4892.

Var. *velutina*, leaflets, more or less velvetty beneath. *C. velutina*

Roemer Synops. fasc. I, p. 135; Kurz For. Flora Burma I, 227; C. DC. Monogr. Phaner. I, 717. *C. Nimmonii* Grah. in Wight Ill. 148; Dalz. and Gibs. Fl. Bombay, 38. *Plageotaxis velutina*, Wall. Cat. 1270. *Cedrela velutina*. DC. Prod. I, 625. ? *Cedrela villosa*, Roxb. Hort. Beng. 18. ? *Melia tomentosa*, Kurz Rep. Veg. Andam. ed. i. p. iv., (*not of Roxburgh*). ? *Toona velutina*, *Roem.* Synops. Monogr., i. 139. ? T. *villosa*. *Roem*, l. c. 140.

Malacca: Maingay. Andaman Islands: King's Collectors. DISTRIB. Burma, British India, Ceylon.

13. CEDRELA, Linn.

Tall trees with coloured wood. *Leaves* pinnate; leaflets numerous, opposite or sub-opposite, entire or serrate. *Panicles* terminal and sub-terminal. *Flowers* white, pentamerous. *Calyx* short, 5-cleft. *Petals* sub-erect, oval, imbricated, free. *Stamens* 5, free, inserted at the top of the disk, rarely alternating with staminodes, filaments subulate. *Anthers* oblong, versatile. *Disk* thick or raised, 5-lobed. *Ovary* sessile on the top of the disk, 5-celled; *cells* alternate with the calyx-lobes, each with 8–12 bi-seriate pendulous ovules; *style* filiform; *stigma* discoid. *Capsule* coriaceous, 5-celled, septifragally 5-valved, *valves* consisting of two plates. *Seeds* compressed, winged at the apex or at both ends, with fleshy albumen; *cotyledons* flat, sub-foliaceous.—DISTRIB. About 16 species, inhabiting Tropical Asia, Australia, and America.

CEDRELA FEBRIFUGA, Forsten Diss. Cedrel. 16. A tree 80 to 150 feet high; young branches puberulous, lenticellate. *Leaves* 15 to 24 in. long, glabrous; leaflets membranous, 7 to 10 pairs, obliquely ovate-oblong, shortly and bluntly acuminate, the base broad and unequal-sided, the edges entire; main nerves 12 to 15 pairs, sub-horizontal, distinct beneath when dry; length 3·5 to 4·25 in., breadth 1·75 to 2 in., petiolule ·2 in. *Panicles* terminal, shorter than, or as long as the leaves, spreading, glabrous; their ultimate branches short, cymose, crowded. *Flowers* ·2 in. in diam., on short pedicels. Segments of the calyx spreading, much shorter than the petals, obtuse, pubescent at the edges. *Petals* broad, obtuse, pubescent. *Stamens* 6, slightly shorter than the petals, the filaments and ovary sericeous. *Capsule* 1 in. long, lenticellate. *Seeds* winged at each end, ·6 to ·7 in. long. Blume Bijdr. I, 180; A. Juss. Mem. Mel. 103; Miq. Flor. Ind. Bat. V. I, pt. 2, 548; Suppl. 197; Ann. Mus. Lugd. Bat. IV, 63; De Cand. Monogr. Phaner. I, 744. *C. Toona*, Hiern (not of Roxb.) Hook. Fl. Br. Ind. I, 569. *Toona febrifuga*, Roem. Syn. fasc. I, 139.

Penang: Curtis, No. 826. Perak: King's Collector, No. 10403.

In the Flora of British India, Mr. Hiern has reduced this to

C. Toona, Roxb. And there is no doubt that the flowers of the two are very similar, differing chiefly in the hairiness of the petals and stamens of *C. febrifuga*. The panicles, however, of *C. febrifuga* are longer and their ultimate branches are shorter and denser than those of *C. Toona*. The capsules, moreover, are much longer (1 in. as against ·6 in.). The flowers of all the species of *Cedrela* are very much alike. I hesitate therefore, to follow Mr. Hiern merely because very good distinctive characters cannot be had from the flowers, and I prefer to follow De Candolle in maintaining this as a species. The nearest ally of *C. febrifuga* is undoubtedly *C. microcarpa* C. DC.

Order XXVIII. CHAILLETIACEÆ.

Trees or shrubs. *Leaves* alternate, quite entire; *stipules* 2, deciduous. *Flowers* small, unisexual or polygamous, in corymbose cymes; *peduncles* sometimes adnate to the petiole. *Sepals* 5, free or connate, sometimes unequal, imbricate. *Petals* 5, free, sub-perigynous, equal or unequal, notched or 2-fid, with often an inflexed lamina which is adnate to the face of the petal, usually open in æstivation. *Stamens* 5, sub-perigynous, all or some only fertile, free or adnate to the corolla; *Anthers* oblong, connective often thickened at the back. *Disk* of 5 glands or scales, or a 5-glandular or -lobed cup. *Ovary* free, pubescent or villous, 2–3-celled; *styles* 1–2–3, free or more or less connate; *stigmas* simple or capitate; *ovules* anatropous, pendulous in pairs from the top of each cell. *Drupe* pubescent or hispid, oblong, transversely oblong or didymous, compressed; *epicarp* entire or dehiscent; *endocarp* indehiscent or not, 1–3-celled; *cells* 1-seeded. *Seed* pendulous, hilum broad, testa membranous, albumen 0; *embryo* large; *cotyledons* thick, radicle small, superior.—A small chiefly tropical order, of 3 genera and about 40 species.

1. CHAILLETIA, DC.

Flowers polygamo-monœcious. *Sepals* 5, unequal, united at the base or above it, obtuse. *Petals* 5, 2-lobed, narrow, free. *Stamens* 5, sometimes slightly adnate at the base to the petals. *Disk* of 5 quadrate scales placed opposite the petals. *Ovary* 2–3-celled.—DISTRIB. Tropical Asia, Africa, and especially America; species about 30.

Leaves oblong or elliptic, lanceolate.

Leaves very thin, quite glabrous; cymes globular, ·25 in. to ·4 in. in diam. ... 1. *C. tenuifolia*.

Leaves coriaceous, glabrous except the midrib, strigose at the base; cymes 1 to 2 in. in diam. ... ... 2. *C. Hookeri*.

Leaves membranous, with many fulvous bristles on the edges midribs and nerves 3. *C. Griffithii.*
Leaves elliptic or oblong-elliptic
Midribs of leaves strigose beneath; cymes ·5 in. in diam.; ripe drupes ·65 in. broad 4. *C. Helferiana.*
Midribs of leaves quite glabrous; cymes ·3 in. in diam.; ripe drupes 1·25 in. in diam. ... ... 5. *C. Laurocerasus.*
Leaves elliptic but more or less ob-lanceolate or obovate, glabrous ... ... 6. *C. andamanica.*
Leaves elliptic-obovate, retuse, minutely tomentose on the lower surface ... ... 7. *C. deflexifolia* var. *tomentosa.*

1. CHAILLETIA TENUIFOLIA, King, n. sp. A shrub, 6 feet high; young branches, angular, puberulous. *Leaves* thinly membranous, elliptic-lanceolate, tapering to either end, the apex shortly acuminate: both surfaces glabrous and reticulate; main nerves 5 to 8 pairs, ascending, curving and interarching boldly, depressed on the upper, prominent on the lower surface; length 6 to 8 in., breadth 2·25 to 2·75 in.; petiole ·15 in., strigose. *Cymes* small, globular, ·25 to ·4 in. in diam., axillary, solitary; their pedicels ·15 in., strigose. *Flowers* sub-globular, ·05 in. in diam. *Sepals* erect, elliptic, obtuse, minutely sericeous outside, glabrous inside. *Petals* shorter but broader than the sepals, glabrous, slightly bifid at the apex, the lobes sub-acute. *Stamens* shorter than the petals, the filaments slightly sericeous, shorter than the oblong innate anthers, connective slightly sericeous. *Ovary* ovoid, densely sericeous-lanate; *style* short. *Ripe fruit* deeply 3-lobed ·6 in. long and ·75 in. broad.

Perak: King's Collector, No. 3498.

This species shows no tendency to become scandent.

2. CHAILLETIA HOOKERI, King, n. sp. A climber; young branches terete, puberulous at first, afterwards glabrous. *Leaves* coriaceous, oblong-lanceolate and acuminate (rarely oblong and obtuse or sub-acute), the base narrowed, reticulate and shining on both surfaces, glabrous except a few strigose hairs on the midrib near the base; main nerves 8 to 10 pairs, curving and interarching far from the edge; length 4·5 to 6·5 in., breadth 1·5 to 2 in.; petiole ·25 in., strigose. *Cymes* axillary, usually in pairs, pedunculate, tomentose, dichotomous, spreading, 1 to 2 in. in diam., the peduncles ·5 to ·75 in. long. *Flowers* about ·1 in. long. *Sepals* oblong, blunt, erect, concave, sericeous-tomentose outside, glabrous inside. *Petals* glabrous, shorter but broader than the sepals, deeply divided into two concave irregularly obovate overlapping

segments. *Stamens* about as long as the petals, glabrous; *anthers* adnate, blunt, broad, the cells on the edges of the connective. *Ovary* ovoid, densely lanate-sericeous; *style* elongate, thin. *Ripe drupe* unknown. Wall. Cat. No. 7443.

Penang: Porter. Perak: Scortechini.

This is the species referred to by Sir Joseph Hooker (Fl. Br. Ind. I, 572), as probably an undescribed species of *Chailletia*. The species, when Sir Joseph wrote, was known only by Porter's incomplete specimens. A few specimens of what is evidently the same plant were collected by the late Father Scortechini in Perak, and these have enabled me to describe the flowers. The fruit, however, still remains unknown.

3. CHAILLETIA GRIFFITHII, Hook. fil. Fl. Br. Ind. I, 571. A slender climber; young branches striate, dark-coloured when dry, clothed with numerous long, spreading, stiff, fulvous hairs with minute soft, short, white pubescence between. *Leaves* membranous, oblong-lanceolate, acuminate, the base rounded or minutely cordate; upper surface glabrous except the sparsely bristly midrib, the lower with numerous bristles on the midrib and a few scattered elsewhere chiefly on the nerves, the edges ciliate; main nerves 9 to 11 pairs, ascending, rather bold beneath; length 4 to 7 in., breadth 1 to 2 in., petiole ·1 in., densely bristly. *Cymes* globular, axillary, sessile, densely bristly, ·4 to ·5 in. in diam. *Flowers* campanulate, nearly ·25 in. across at the mouth. *Sepals* sub-erect, narrowly ovate, densely sericeous on the outer, and slightly pubescent on the inner surface. *Petals* glabrous, not longer than the sepals but broader, obovate, the apex shortly bifid, the lobes sub-acute, concave. *Stamens* as long as the petals, the anthers short, broadly ovate, the cells anterior. *Ovary* ovate, densely lanate-sericeous; *style* shorter than the stamens; *stigmas* 3, small, truncate. *Ripe fruit* (*fide* Hooker) 1·5 in. long, 2-celled. *C. lanuginosa*, Maing. MSS.

Perak; King's Collector, No. 6117. Malacca; Griffith, No. 2169 (Kew Distrib.), Maingay, No. 370.

Griffith describes this as "a shrub." It is actually a climbing shrub 15 to 20 feet long. The flowers are white.

4. CHAILLETIA HELFERIANA, Kurz in Journ. As. Soc. Bengal, XLI, (1872), Pt. 2, 297. Scandent; young branches adpressed-yellowish pubescent, terete. *Leaves* thinly coriaceous, elliptic or oblong-elliptic, shortly and abruptly acuminate, the base cuneate, both surfaces reticulate (the lower rather obscurely so) and glabrous, the midrib strigose beneath; main nerves 7 or 8 pairs, spreading, faint; length 4 to 6 in., breadth 1·25 to 2·25 in.; petiole ·25 in., strigose. *Cymes* solitary, axillary, about ·5 in. in diam.; their pedicels about ·3 in. long, strigose.

Flowers sub-globular, less than ·1 in. long. *Sepals* broadly ovate, blunt, sericeous on the outer, pubescent on the inner surface. *Petals* smaller than the sepals, elliptic, obtuse, shortly bifid, the lobes blunt. *Filaments* very short, the anthers ovate, the cells anterior. *Ovary* conical, laxly sericeous. *Ripe drupe* transversely oblong, compressed, ·65 in. broad, and only ·4 in. long, minutely tomentose. Hook. fil. Fl. Br. Ind. I, 570.

Langkani; Curtis, No. 1687.—DISTRIB. Burma, Wall. Cat. 4038. Tenasserim; Helfer (Kew Distrib.), No. 2172.

Curtis's Langkani specimens are in fruit only, and those of Helfer's Tenasserim collecting (the type of the species) are in flower only. But the two seem identical. I have not seen the Wallichian sheet No. 4038.

5. CHAILLETIA LAUROCERASUS, Planch. ex Hook. fil. Fl. Br. Ind. I, 572. A scandent glabrous shrub 30 to 40 feet long; young branches slender, dark-coloured. *Leaves* coriaceous, elliptic or elliptic-oblong, obtusely acuminate, the base narrowed, upper surface shining when dry, the lower paler; main nerves 7 or 8 pairs, spreading, faint; length 3·5 to 4·5 in., breadth 1·5 to 2·5 in., petiole about ·1 in. *Cymes* axillary, globose, few-flowered, ·3 in. in diam., shortly pedunculate. *Flowers* ·15 to ·2 in. in diam. *Sepals* hoary outside, glabrous inside, broadly ovate or orbicular, concave. *Petals* longer than the sepals, glabrous, oblong, cut half way down into two oblong blunt concave slightly divergent segments. *Filaments* nearly as long as the petals; *anthers* shortly ovate. *Ovary* densely lanate-sericeous, broadly ovoid; *style* stout, *stigma* concave. *Drupes* transversely oblong or globose, 1·25 in. in diam. when ripe, the epicarp hoary; *endocarp* thick, tuberculed outside, 1- or 2-seeded. Wall. Cat. 7513, (*indeterminatæ*).

Penang; common. Perak: King's Collector.

6. CHAILLETIA ANDAMANICA, King n. sp. A small tree; young branches pale-brown, lenticellate, puberulous. *Leaves* thinly coriaceous, elliptic-oblanceolate or elliptic-obovate, abruptly and shortly blunt-acuminate, much narrowed at the base; both surfaces glabrous, minutely reticulate, pale when dry; main nerves 4 to 6 pairs, much curved and interarching far from the edge, only slightly prominent on either surface; length 3 to 4·75 in., breadth 1·25 to 2·5 in., petiole ·15 to ·2 in. *Stipules* lanceolate, about as long as the petiole. *Flowers* in dense axillary shortly pedunculate dichotomous cymes. *Buds* ovoid-globular. *Sepals* 5, sub-rotund, very concave, hoary externally, much imbricate. *Petals* 5, quadrate, not bifid, glabrous, shorter than the sepals. *Stamens* shorter than the petals, the filaments very short, anthers ovate. *Rudimentary ovary* ovoid, compressed, hairy. *Female flowers* not seen. *Fruit* about ·5 in. broad, and ·4 in. depth, transversely oblong, much compressed, puberulous, divided into two lobes by a deep vertical groove,

2-celled, 2-seeded, (often from the abortion of one of the cells) ovoid, 1-celled and 1-seeded.

South Andaman Island; King's Collectors.

The greatest breadth of the leaves in this species is above the middle, and in this respect it differs from *C. gelonoides.* The point of the leaves is also shorter than in that species; the flowers are less hairy, the cymes less crowded, and they are pedunculate and not sessile as in *C. gelonoides.*

7. CHAILLETIA DEFLEXIFOLIA, Turcz. in Bull. Mosc. 1863, pt. 1, 611, var. *tomentosa.* A climber, 10 to 30 feet long; young branches densely and minutely olivaceous-tomentose. *Leaves* thinly coriaceous, elliptic-obovate, retuse; upper surface minutely reticulate when dry, glabrous when adult except the minutely tomentose midrib and nerves; lower surface softly and minutely pilose, the midrib tomentose as are the 5 to 7 pairs of curved, spreading, main nerves; length 4·5 to 6·5 in., breadth 2·5 to 3·25 in., petiole ·3 to ·4 in. *Cymes* axillary, and often terminal, pedunculate, tomentose, dichotomous, spreading, often 3 in. in diam.; the peduncles 1 to 1·25 in. long, stout. *Flowers* ·25 in. in diam. *Sepals* oblong-lanceolate, deflexed, sericeous-tomentose outside, glabrous inside. *Petals* as long as the sepals, deeply divided into 2 lanceolate segments. *Stamens* as long as the petals, the anthers shortly ovate. *Ovary* densely lanate-sericeous, depressed globular, the style slender, stigma small. *Drupes* compressed, rotund-reniform, sericeous, rugose, pitted, 1 in. broad; the endocarp very hard, 2-celled, 2-seeded. Hook. fil. Fl. Br. Ind. I, 571; Wall. Cat. 9016 (*indeterminatæ*).

Malacca; Griffith, Maingay. Perak; King's Collector, Wray, Scortechini.

Order XXIX. OLACINEÆ.

Trees or shrubs, rarely herbs, sometimes climbing. *Leaves* alternate, rarely opposite, simple or lobed, penni- or palmi-nerved, exstipulate. *Inflorescence* cymose or racemose, rarely capitate, terminal, axillary or extra-axillary, sessile or more or less peduncled. *Flowers* regular, hermaphrodite, polygamo-diœcious or diœcious. *Calyx* usually small, 4–5-toothed, sometimes accrescent, free or adherent to the fruit, lobes valvate or imbricate. *Petals* 3–6, valvate or imbricate, free, or more or less coherent. *Stamens* 3–15, inserted with the petals, free or adnate to them and either opposite to or alternate with them, all fertile, or some (staminodes) anantherous, disunited or more or less monadelphous. *Anthers* erect, 2-celled, dehiscing longitudinally. *Disc* hypogynous or perigynous, cup-shaped, often absent. *Ovary* free, or half inferior, 1-celled or imperfectly 2–3–5-celled (from the dissepiments not reaching the apex of the cavity). *Style* simple or 0, rarely divided; *stigma* 1 rarely 2, entire or lobed; *ovules* 1–5, pendulous from the apex of a minute free central placenta, or from the side or apex of the ovarian cavity; *funicle* (or placenta?) often dilated into a thickened process above the ovule. *Fruit* drupaceous or dry, indehiscent, 1- rarely 2-celled, 1- rarely 2-seeded, free, or more or less adnate to the calyx-tube and disk. *Seed* pendulous; albumen fleshy, entire or lobed, rarely 0; *radicle* superior; *cotyledons* leafy, flat or folded, rarely fleshy.—DISTRIB. Genera about 45, species about 220, widely distributed through the Tropics of both hemispheres.

The *Olacineæ* are rather an assemblage of plants than a Natural Order. The solitary character which is common to all the species included under the title is pendulous ovulation; and even that character is obscured by the fact that, in a number of the genera, the ovules are pendulous from the apex of a minute free central placenta which does not grow as the pistil developes, so that the seeds are erect in the fruit and have the appearance of originating from a basal placenta. In the remaining genera, both ovules and seeds are unmistakably pendulous from the apex, or from near the apex, of the cavities of the ovary and fruit. The majority of the genera have hypogynous stamens and superior fruit. But in *Erythropalum* the stamens are perigynous and the fruit is inferior; while *Cansjera* and *Lepionurus* have their stamens perigynous in the flower, but the fruit (from the development of the fertilized pistil in a downward direction) is most distinctly inferior. In by far the greater majority of the species the stamens are free from each other, or, at the most, are slightly coherent by their bases: but in *Harmandia* the sessile anthers are attached near the mouth of a fleshy staminal tube like that found in *Meliaceæ*; and this tube, in an anantherous condition, is found in the pistillate flowers. By far the greater number of the genera have both calyx and corolla; but in *Cansjera* and *Lepionurus* the perianth is single, and in *Phytocrene* and *Miquelia* the organs which take the place of the outer whorl of the flower appear to be rather bracts than a true calyx. In most of the genera the petals are really free from each other; for, although many of them cohere by their edges for a time, they ultimately become separate; while in a smaller number there is genuine cohesion near their bases. In *Harmandia* however the corolla is gamopetalous and urceolate at all times and its texture is fleshy.

All the genera treated of below are woody except *Cardiopteris* which is herbaceous, and which moreover has milky juice. And all the genera have alternate leaves except *Ctenolophon* in which the leaves are opposite. The whole order appears to me to be in want of revision: and the study of the species described below leads me to incline to the opinion that several of the sub-tribes would be better treated as distinct natural orders; while one (*Opilieæ*) might be transferred to *Santalaceæ*.

FRUIT DRUPACEOUS: STIGMA 1.
Ovules pendulous from the apex of a minute
axile placenta; seed spuriously erect.
Dichlamydeous, ☿ : fruit superior.
Sub-Tribe I.—*Olaceæ*. Stamens aniso-

merous, twice as many as or equal to and opposite the petals: ovary 2- to 5-celled at the base, 1-celled at the apex, or simply 1-celled.

Fruit superior.

Calyx much enlarged in the fruit.

Fertile stamens 3 to 5, not in a tube ... ... 1. *Olax.*

Stamens 4, the filaments forming a fleshy tube ... 2. *Harmandia.*

Calyx not enlarged in the fruit.

Fertile stamens 12 to 15 ... 3. *Ochanostachys.*

Fertile stamens 5 ... 4. *Bracea.*

Fruit inferior ... ... 5. *Strombosia.*

Monochlamydeous, ⚥ ; fruit inferior.

Sub-Tribe II.—*Opilieæ.* Stamens equal in number to the segments of the perianth and opposite to them ; ovary 1-celled, 1-ovuled.

Scandent ... ... 6. *Cansjera.*

Shrubby ... ... 7. *Lepionurus.*

Ovules and seeds pendulous from the apex of the ovary and fruit.

* Stamens hypogynous.

Sub-Tribe III.—*Ximeniae.* Stamens as many as or twice as many as the petals; ovary 2- to 4-celled at the base, 1-celled at the apex.

Leaves opposite ... ... 8. *Ctenolophon.*

Leaves alternate.

Fertile stamens 10.

Stamens hypogynous, free from the petals ... ... 9. *Ximenia.*

Stamens attached by pairs to the petals ... ... 10. *Scorodocarpus.*

Fertile stamens 6, concealed in the concavities of the petals ... 11. *Anacolosa.*

Sub-Tribe IV.—*Icacineæ.* Flowers dichlamydeous, ⚥, or polygamo-diœcious : stamens equal in number to the petals and alternate with them ; ovary 1- rarely 2-celled, ovules 2 (rarely 1). Shrubs or trees.

Ovary and fruit 1-celled.

Flowers polygamo-dioeceous; ovary in female flowers cylindric, with large sessile discoid stigma.

Sepals 5, distinct, imbricate; male flowers in short axillary interrupted glomerulose spikes ... ... 12. *Platea.*

Calyx cupular, 4 5-toothed, flowers in cymes ... 13. *Gomphandra.*

Flowers hermaphrodite, stigma minute ... ... 14. *Lasianthera.*

Ovary and fruit 2-celled, the cells 1-ovulate (1 cell aborting) ... 15. *Gonocaryum.*

Sub-Tribe V.—*Phytocreneæ.* Flowers monoecious or dioeceous, mono-ordichlamydeous, 4- or 5-merous (the pieces imbricate): stamens equal in number to and alternate with the segments of the perianth in the monochlamydeous, and with those of the corolla in the dichlamydeous species: ovary 1-celled, ovules 2. Scandent shrubs.

Flowers monochlamydeous.

Flowers 4-merous, those of both sexes in capitules, bracteoles close to the flower; drupe bristly ... ... 16. *Phytocrene.*

Flowers 5-merous, the males umbellate, the females capitate, bracteoles separated from the flower by a long stalk; drupe not bristly ... 17. *Miquelia.*

Flowers dichlamydeous.

Flowers sessile in long pendulous interrupted spikes; filaments longer than the anthers: drupe pulpy ... ... 18. *Sarcostigma.*

Flowers in cymose panicles; filaments shorter than the anthers; drupe with very little, if any, pulp ... 19. *Iodes.*

** Stamens perigynous.

Sub-Tribe VI.—*Erythropaleæ.* Flowers dichlamydeous, ⚥. Petals 5, perigynous, the stamens as many as and inserted opposite to them. Ovary half-immersed in the perigynous disk, 1-celled, with 1 to 3 ovules. Fruit inferior, crowned by the persistent calyx-lobes and by the disc, pericarp splitting vertically into 3 to 5 pieces. Scandent tendril-bearing shrubs ... 20. *Erythropalum.*

FRUIT SAMAROID; STIGMAS 2.

Sub-Tribe VII.—*Cardiopterideæ.* Flowers dichlamydeous, ⚥ : corolla gamopetalous, the stamens equal to and alternate with its segments; ovules pendulous; stigmas 2, one at least of them persistent at the apex of the samaroid fruit.

Trees; ovary 2-celled, with 1 ovule in each cell, fruit 2-celled ... ... 21. *Pteleocarpa.*

Herbs; ovary 1-celled, ovules 2 (1 usually abortive), fruit 1-celled, juice milky ... 22. *Cardiopteris.*

1. OLAX, Linn.

Trees or shrubs, often scandent, sometimes armed. *Leaves* alternate, petioled, simple. *Racemes* axillary, simple, or branched. *Bracts* minute. *Calyx* minute, cup-shaped, truncate or obscurely toothed, accrescent. *Petals* 4 or 5, hypogynous, valvate, free or more or less coherent. *Fertile stamens* usually 3, generally opposite the edges of the petals and attached to their bases, rarely opposite their centres; *anthers* adnate to the filaments, oblong, 2-celled, dehiscing longitudinally. *Staminodes* 5-6, bifid, usually opposite the petals. *Ovary* free, usually surrounded by a shallow, cup-shaped, hypogynous disk, more or less 3-celled below, 1-celled above; *style* simple, terminal, stigma 3-lobed; *ovules* 3, linear, pendulous from the apex of a central placenta. *Fruit* more or less covered by the accrescent fleshy calyx; *stone* crustaceous, 1-celled, 1-seeded. *Seed* inverse, albuminous; *embryo* minute, in the apex of albumen; *radicle* superior.—DISTRIB. 25–30 species, natives of the tropics of the Old World.

1. OLAX IMBRICATA, Roxb. Fl. Ind. I, 164. A scandent unarmed

shrub; young branches terete, puberulous when very young. *Leaves* coriaceous, oblong-lanceolate to ovate-oblong, acute, the base rounded or narrowed; both surfaces glabrous, the upper shining, reticulate, the lower dull and the nervation indistinct; main nerves 8 or 9 pairs, faint, spreading; length 3·5 to 5·5 in., breadth 1·25 to 2·75 in., petiole ·2 to ·35 in. *Racemes* about ·5 in. long, many-flowered; the bracts rather large, ovate, concave, imbricate when young, deciduous. *Flowers* about ·5 in. long; petals 6, united in pairs. *Fertile stamens* 3, about as long as the pale staminodes. *Fruit* sub-globose, the apex truncate, ·5 in. in diam., enveloped except at the apex by the accrescent calyx. Wall. Cat. 6775; A. B. Decaisne Nouv. Ann. Mus. III, 438; Miq. Fl. Ind. Bat. I, Pt. I. 785; Hook. fil. Fl. Br. Ind. I. 577; Kurz For. Flora Burma I, 234; Valeton, Olacineæ, 115.

Andaman and Nicobar Islands, Malacca. DISTRIB: Java, Phillippines, Burmah, Chittagong.

Although I have not included *O. merguensis*, Planch as a synonym of this, I cannot see how it can be specifically separated. *O. Wightiana*, Wall. also appears to me to resemble this too closely to be kept distinct as a species.

2. HARMANDIA, Pierre.

Trees with alternate, simple, entire, petiolate leaves. *Flowers* unisexual, racemose, pedicellate, solitary in the axils of bracteoles. *Calyx* cupular, entire or 4-toothed, greatly enlarged and persistent in the fruit. *Corolla* campanulate or urceolate, fleshy, with 4 short acute valvate lobes (in the female flowers 6-to 8-lobes?) *Disc* short, thin, annular, crenulate, deciduous, embracing the outside of the base of the cylindric staminal tube. *Anthers* 4, sessile, inserted at the mouth of the thick fleshy staminal tube opposite the teeth of the corolla, bilocular, introrse, the apices reflexed, the connective thick. *Pistil* superior, pyramidal, surrounded in the female flower by the barren staminal tube, 1-celled; *stigma* 3-lobed, sessile; *ovules* 2 (usually only 1), short, free, descending from the apex of the short trigonous central placenta. *Drupe* oblong, 1-seeded, surrounded at the base by the large, fleshy, spreading, coloured accrescent calyx; *epicarp* fleshy, *endocarp* ligneous. *Seed* solitary, filling the cavity of the fruit, its testa thin and inseparable from the fleshy albumen; *embryo* minute, excentric, oblique, near the apex of the allumen. *Cotyledons* flat, shorter than the radicle. DISTRIB. 2 species; both Malayan.

This genus founded by M. Pierre (Bull. Soc. Linn. Paris, No. 97, p. 770), is remarkable in having a fleshy staminal tube very like that of some *Meliaceæ*, and for the enormous development of the accrescent calyx which forms a large coloured collar round the ripe fruit.

1. HARMANDIA KUNSTLERI, King, n. sp. A glabrous tree 30 to 40 feet high; young branches slender, striate. *Leaves* coriaceous, ovate-lanceolate or lanceolate, shortly and bluntly acuminate, the base cuneate; main nerves about 6 pairs, very indistinct on both surfaces; length 2·5 to 3·5 in., breadth 1 to 2 in., petiole ·25 to ·5 in. *Racemes of female flowers* axillary, solitary, not much longer than the petioles. *Flowers* ·15 in. long, solitary in the axils of oblong obtuse bracteoles. *Calyx* flat, spreading, with 4 very obtuse teeth. *Corolla* four times as long as the calyx, urceolate; teeth 4, acute. *Ovary* hidden (except the stigmas) by the barren staminal tube and by the corolla, pyramidal, the style short; 1-celled with a single spuriously erect ovule: *stigma* solitary, capitate. *Fruit* oblong, obtuse, 1·25 in. long, and ·6 in. in diam., surrounded at the base by the greatly enlarged coloured corrugated calyx which forms a frill 3 to 4 in. in diam.

Perak; King's Collector.

A very striking plant. The accrescent calyx forms an enormous waxy collar round the base of the fruit which, at first green, changes into a beautiful flesh-colour, the central part being bluish-black. This species is closely allied to *Harmandia mekongensis*, Pierre (For. Flora Coch. China, t. 264), from which it differs in having an urceolate (not tubular-campanulate) corolla and a larger fruit with the accrescent calyx less invaginated at the base.

3. OCHANOSTACHYS, Mast.

Trees or shrubs. *Leaves* alternate, petiolate, penni-nerved. *Flowers* numerous, on long slender branching axillary spikes. *Calyx* cup-shaped, 4–5-toothed, not accrescent. *Petals* 4–5, free, valvate. *Stamens* 12–15, hypogynous, or adherent to the base of the petals; filaments subulate, glabrous; *anthers* 4-celled, opening longitudinally; *staminodes* 0. *Disk* hypogynous, fleshy, very shallow, annular, inconspicuous; *ovary* free, sub-hemispheric, incompletely 3-celled beneath, 1-celled above; *style* short, cylindric; *stigma* minute, terminal, 3-lobed; *ovules* 1 in each cell, pendulous from the apex of a central placenta. *Fruit* drupaceous, 1-celled, 1-seeded.—DISTRIB. Species 1 or 2; natives of the Malay Peninsula and Borneo.

1. OCHANOSTACHYS AMENTACEA, Mast. in Hook. fil. Fl. Br. Ind. I, 579. A tree 30 to 40 feet high; young branches glabrous, the tips alone puberulous. *Leaves* thinly coriaceous, elliptic-oblong, entire, bluntly sub-acuminate, the base slightly narrowed, both surfaces glabrous; main nerves 5 (rarely 4) pairs, ascending, prominent on the lower, depressed on the upper surface when dry; length 3 to 5 in., breadth 1·5 to 2·5 in., petiole ·5 to ·75 in. *Racemes* as long as or longer

than the leaves, narrow, sometimes branched, axillary, interrupted. *Flowers* on short pedicels with minute ovate, acute bracts at the base; oblong-ovate in bud, less than ·1 in. long. *Petals* ovate, glabrous outside with a few coarse hairs inside. *Ovary* vertically striate. *Fruit* ovoid-pyriform, 1·25 in. long, and ·8 in. in diam.; the pericarp glabrous, thin, the endocarp bony, with one large cell and a single seed. Valeton, Olacineæ, 104. *Petalinia bancana*, Beccari in Malesia, I, 257.

In all the provinces except the Andaman and Nicobar Islands. Common.—DISTRIB. Borneo.

This is a very common tree in the Malayan Peninsular where its vernacular name is "Petaling." The same name is applied to it in Borneo, and of this name Beccari's *Petalinia* is an adaptation.

4. BRACEA, nov. gen. King.

Arboreous; *leaves* alternate, simple, entire, petiolate. *Panicles* few-branched, axillary or terminal, nearly as long as or longer than the leaves. *Flowers* hermaphrodite, small, shortly pedicelled, scattered or sub-glomerulate, minutely bracteolate. *Calyx* of 5, free, imbricate, broad, non-accrescent, campanulate sepals. *Petals* 5, hypogynous, slightly united at the base, much imbricate, glabrous. *Stamens* 5, opposite the petals; filaments shorter than the anthers, very broad. *Anthers* ovate, innate, 2-celled, with introrse longitudinal dehiscence. *Staminodes* none. *Ovary* broadly ovate, pyramidal, tapering to the short style, imperfectly 2-celled at the base, 1-celled towards the apex; *stigma* small, 2-lobed. *Ovules* 2, from a short axile basilar placenta. *Fruit* drupaceous, 1-celled, with a single spuriously erect seed.

A genus near *Ochanostachys*, Oliver; but with only 5 stamens, very different in form from those of that genus. I dedicate this to Mr. L. Brace, formerly Curator of the Calcutta Herbarium.

1. **BRACEA PANICULATA**, n. sp., King. A glabrous tree 50 to 70 feet high; young branches dark-coloured, smooth. *Leaves* coriaceous, ovate to elliptic, sub-acuminate, the base rounded; upper surface shining, the lower dull; main nerves 7 or 8 pairs, curved, spreading, slightly prominent beneath when dry; length 3·5 to 8·5 in., breadth 1·85 to 2·75 in., petiole ·65 to ·8 in. *Panicles* with few, spreading, spike-like branches. *Flowers* ·1 in. long, on pedicels of about the same length, glabrous, the calyx half as long as the corolla; petals and sepals broadly ovate. *Stamens* shorter than the petals, glabrous; *disk* hypogynous. *Fruit* drupaceous, ellipsoid, blunt, glabrous (unripe), ·75 in. long, and ·4 in. in diam.; the calyx persistent at its base, but not accrescent; *pericarp* fleshy, *endocarp* leathery. *Seed* solitary, attached to the base of the cell.

Perak; Scortechini, No. 288, King's Collector, No. 8086.

5. STROMBOSIA, Blume.

Trees or shrubs. *Leaves* alternate, petioled, simple, penni-nerved. *Inflorescence* shortly cymose. *Flowers* regular, hermaphrodite. *Calyx* a shallow cup, more or less 5-lobed, inferior (partly superior in some species). *Petals* 5, free, hairy within. *Stamens* 5, opposite the petals and adnate to their bases. *Anthers* 2-celled, introrse. *Staminodes* 0. *Ovary* wholly superior, or (in some species) partly inferior, imperfectly 4- 5-celled, surrounded by a perigynous lobed disk. *Style* simple. *Ovules* 4–5, pendulous from a central placenta. *Fruit* drupaceous, surmounted by the remains of the calyx-lobes and of the style, stone crustaceous. *Seed* pendulous, embryo minute within fleshy albumen. DISTRIB. Species 6, natives of the Western Peninsula, Ceylon and the Malayan Archipelago.

Flowers in pedicelled few-flowered cymes ... 1. *S. javanica.*
Flowers in sessile many-flowered fascicles ...
  Leaves ovate to oblong-ovate; petals ·2 in. long ... ... 2. *S. multiflora.*
  Leaves more or less rotund; petals ·15 in. long ... ... 3. *S. rotundifolia.*

1. STROMBOSIA JAVANICA, Blume Bijdr. 1154. A tree 20 to 50 feet high; young branches rather slender, glabrous *Leaves* thinly coriaceous, glabrous, oblong to elliptic, shortly acuminate, the base rounded; main nerves 5 or 6 pairs, curved, ascending, slightly prominent beneath; length 4 to 7 in., breadth 1·65 to 2·65 in., petiole ·6 to ·75 in. *Cymes* axillary, not longer than the petioles, few-flowered; bracteoles small, deciduous, leaving pale scars. *Flowers* ellipsoid in bud, about ·2 in. long. *Calyx* nearly flat with 5 short lobes, inferior in the flower; (accrescent and half inferior in the fruit). *Petals* erect, much exceeding the calyx, oblong, obtuse, hairy towards the apex. *Stamens* 5, opposite to, nearly as long as, and adhering to the petals. *Ovary* elongate, tapering into the short style. *Fruit* oblong-ovoid, glabrous, ·8 in. long, and ·6 in. in diam., the apex crowned by the calyx and disc. Blume Mus. Bot. Lugd. Bat. I, 251; Miq. Fl. Ind. Bat. I, Pt. I, 787; Mast. in Hook. Fl. Br. Ind. I, 579; Kurz For. Flora Burmah, I, 235; Valeton, Olacineæ, 86.

Penang: Wallich. Malacca: Maingay. Perak: King's Collectors.

2. STROMBOSIA MULTIFLORA, King, n. sp. A glabrous tree 50 feet high and upwards; young branches slender, striate, minutely lenticellate, cinereous when dry. *Leaves* coriaceous, ovate to oblong-ovate, acute or shortly acuminate, slightly oblique, rounded at the base, the edges undulate; leaves 5 to 8 pairs, slightly curved, ascending, slightly prominent on the lower, obsolete on the upper, surface; length 2·5 to 4

in., breadth 1·5 to 2 in., petiole ·35 in. *Flowers* in dense axillary fascicles; pedicels shorter than the flowers, each with several rotund, concave, minute bracteoles, one of which is close to the calyx. *Calyx* a shallow cup with 5 broad rounded concave segments. *Petals* ·2 in. long, much longer than the calyx, erect, oblong, obtuse, their apices re-curved, pubescent on the edges and in the upper fourth of the inner surface. *Stamens* opposite the petals to which their filaments are attached for two-thirds of their length; *anthers* short, ovate. *Ovary* sub-globular, grooved, much shorter than the long cylindric style, *stigma* minute. *Fruit* unknown.

Perak: King's Collector, No. 7824. Penang: Curtis, No. 859.

Evidently a *Strombosia*; the fruit, however, is as yet unknown.

3. STROMBOSIA ROTUNDIFOLIA, King. A tree or shrub; young branches rather stout; their bark cinereous, rugose, much lenticellate. *Leaves* coriaceous, more or less rotund, glabrous; main nerves 6 or 7 pairs, rather straight, sub-ascending, obsolete on the upper, slightly prominent on the lower surface when dry; length 2·5 in., breadth 2 in.; petiole ·3 in., stout. *Fascicles* small, axillary, few-flowered, shorter than the petioles; pedicels short, each with 2 or 3 minute rotund scale-like bracteoles. *Calyx* cupular, with 5 broad rounded imbricate teeth. *Petals* ·15 in. long, much longer than the calyx, oblong, hairy on the upper half inside, otherwise glabrous; *filaments* adnate to the petals for half their length, *anthers* ovate. *Ovary* sub-globular, *style* cylindric. *Fruit* (*fide* Masters) "the size of a pea, glaucous, globose." *Anacalosa Maingayi*, Mast. in Hook. fil. Br. Ind. I, 580.

Singapore: Maingay (Kew Distrib.), No. 1019.

A species closely allied to *S. multiflora*, King, but with differently shaped leaves. The fascicles of this are fewer-flowered, and the flowers are smaller than in that species. I have seen only Maingay's specimen of this, and there is no fruit on it. Dr. Masters puts this plant into *Anacalosa*, but its petals and anthers are those of *Strombosia*, to which genus I venture to remove it.

6. CANSJERA, Juss.

Climbing shrubs, sometimes spiny. *Leaves* alternate, entire, penninerved. *Flowers* bracteate, in short axillary spikes, monochlamydeous, hermaphrodite. *Perianth* tubular or urceolate, regular, 4- 5-parted, lobes valvate. *Stamens* as many as the lobes of the perianth and opposite to them; filaments glabrous, free, or attached between the fleshy thick lobes of the disk. *Anthers* small, oblong, adnate, 2-celled, dehiscing longitudinally. *Ovary* superior, ovoid-conical, 1-celled. *Style* cylindric; stigma capitate, 4-lobed. *Ovule* solitary, erect, or pendulous from a short placenta. *Fruit* superior, drupaceous, surrounded at the base by the marcescent perianth; sarcocarp thin, endocarp bony. *Seed* solitary, erect, roundish; embryo in the upper part of the fleshy albumen, radicle superior; cotyledons sometimes 3, very long, plano-convex. DISTRIB. Species 3–4, natives of Tropical Asia and Australia.

CANSJERA RHEEDII, Gmel. Syst. I, 280. A climbing shrub; the young branches olivaceous, puberulous, sometimes spiny. *Leaves* thinly coriaceous, oblong-lanceolate to ovate, acute or acuminate, the base slightly narrowed, both surfaces glabrous; main nerves 3 to 5 pairs, curved, ascending, faint; length 2·5 to 4 in., breadth 1 to 1·5 in., petiole ·15 in. *Spikes* 1 or 2 from an axil, ·5 to 1 in. long, tomentose; bracteoles minute, linear-lanceolate, one at the base of each flower. *Flowers* ·1 in. long, pubescent externally, apices of the teeth of the perianth re-curved. *Fruit* ovoid, ·4 in. long, glabrous; *embryo* straight in the axis of copious albumen. Wall. Cat. 1043, B; Wight Ic. t. 1861; Bedd. Flor. Sylvat. Anal. Gen. t. xxvi.; Thwaites Enum. 251; Brandis For. Flor. 75; Hook. fil. Fl. Br. Ind. I, 582; Kurz For. Flora Burma I, 237: Valeton Olacineæ 158. *C. scandens, Roxb.* Cor. Pl. 103; Fl. Ind. i. 441. *C. malabarica*, Lamk. Dict. iii. 433. *C. zizyphifolia, Griff.* Notul. iv. 360, t. 537, f. 1. *C. martabanica*, Wall. Cat. 7266. Olax? *sumatrana*, Miq. Fl. Ind. Bat. Suppl. i. 342. *Opilia amentacea*, Roxb. Fl. Ind. I, 86 Wall. Cat. No. 2331, *C. Rheede* Hort. Mal. vii. t. 2, 4. Wall. Cat. *Canscora*, No. 7537.

Andaman and Nicobar Islands: Malacca.—DISTRIB. British India, Malayan Archipelago.

I can find no trace of calyx in any of the flowers of this species which I have dissected, and I cannot find that the ovary has more than a single cell. The disc is deeply divided into 4 fleshy acute lobes, between which the stamens are inserted. The fruit is entirely superior. The genus is closely allied to *Champereia*, which has already been transferred by Messrs. Bentham and Hooker to *Santalaceae*. It is also allied to *Lepionurus* and *Opilia*; and, with these, it should, in my opinion, be retransferred to the family *Santalaceae* in which its founder, Jussieu, originally placed it. Wall. Cat. 7537 clearly falls here and not under *Lepionurus sylvestris*. Bl.

7. LEPIONURUS, Blume.

Shrubby. *Leaves* alternate, shortly petioled, simple, penninerved. *Inflorescence* axillary, spicate, with large deciduous bracts, the flowers solitary at the nodes, or in clusters of 3 or 4. *Flowers* monochlamydeous, regular, hermaphrodite. *Perianth* urceolate, the limb 4-parted; lobes valvate, glabrous within. *Stamens* equal in number to the lobes of the perianth and opposite to them. *Anthers* glabrous. *Staminodes* 0. *Disk* fleshy, yellow, lining the perianth-tube. *Ovary* free, oblong-conical; *stigma* sessile, 4-lobed; *ovule* solitary. *Fruit* drupaceous, glabrous, endocarp crustaceous. *Seed* erect; embryo small, in the axis of fleshy albumen, radicle terete, cotyledons ternate.—DISTRIB. Species 2, natives of Tropical Asia.

LEPIONURUS SYLVESTRIS, Blume Bijdr. 1148. A glabrous shrub; the branches sub-striate, pale when dry. *Leaves* membranous, oblong, elliptic-oblong or elliptic, shortly acuminate, the base cuneate; main nerves 7 to 9 pairs, rather straight, ascending; length 4 to 6·5 in., breadth 1·4 to 3·5 in., petiole ·15 to ·35 in. *Spikes* axillary, ·5 to 1·25 in. long, solitary, or in clusters of 2 to 6, their rachises filiform, at first enveloped by the large ovate acute, membranous, deciduous bracts. *Flowers* long, the tube inflated and lined by the adherent disc; the lobes deltoid, spreading when mature. *Anthers* and filaments broad. *Fruit* ellipsoid to ovoid, ·35 to ·6 in. long when ripe. Blume Mus. Bot. Lugd. Bat. I, 246; Miq. Fl. Ind. Bat., Vol. I, Pt. I, 284; *Lepionurus oblongifolius*, Mast. in Hook. fil. Fl. Br. Ind. 583; Valeton, Olacineæ, 153. *Leptonium oblongifolium*, Griff. in Calc. Journ. IV, 236. *Opilia acuminata*, Wall. Cat. 7206, also Wall. Cat. 7464.

Malacca, Penang, Perak, rather common. DISTRIB.—British India' Burma, Malayan Archipelago.

I have not been able to make out, from dissections of dried specimens, the exact attachment of the ovule. But the ripe seed is unquestionably attached to the base of the cavity of the fruit. Whether the ovule was originally erect, or was attached in a pendulous manner, as some botanists assert, from the apex of a short central placenta, I am unable to say. The genus in my opinion is closely allied to *Cansjera*.

8. CTENOLOPHON, Oliv.

Trees. *Leaves* opposite, petiolate, simple, penni-nerved. *Inflorescence* panicled-cymose. *Flowers* regular, hermaphrodite. *Calyx* 5-parted; lobes imbricate, not accrescent. *Petals* 5, free, imbricate, oblong, reflexed after flowering. *Stamens* 10, free, springing from a short, ring-like, hypogynous disk, those opposite the petals longer than the others; *anthers* roundish, apiculate, 2-celled, dehiscing lengthwise. *Staminodes* 0. *Ovary* free, shortly stalked, imperfectly 2-celled; *style* cylindric, bifid at the apex, stigmas capitate; *ovules* in pairs in each cell, collateral, pendulous. *Fruit* coriaceous or crustaceous, 1-celled, 1-seeded, dehiscing irregularly. *Seed* pendulous from the apex of a free central placenta, and provided with a dorsal pectinate crest.—DISTRIB. 2 known species, both Malayan.

1. Inflorescence pale-tomentose; flowers ·2 to ·25 in. long ... ... 1. *C. parvifolius.*
2. Inflorescence rusty-tomentose; flowers ·4 in. long ... ... 2. *C. grandifolius.*

1. CTENOLOPHON PARVIFOLIUS, Oliver in Trans. Linn. Soc. XXVIII, 516, t. 43. A tree; young branches terete, purplish when fresh, cinereous when dry. *Leaves* opposite, coriaceous, elliptic or oblong-elliptic, entire, shortly and obtusely acuminate, the base cuneate or rounded; upper surface shining, the lower dull, both glabrous; main nerves about 10 pairs, faint, spreading, forming a double series of arches within the edge; length 2·5 to 4·5 in., breadth 1·25 to 2 in., petiole ·3 to ·5 in. *Panicles* terminal and axillary, shorter than the leaves, condensed, minutely cano-tomentose; bracts ovoid-deltoid, minute, deciduous; pedicels stout, about as long as the calyx. *Flowers* ·2 to ·25 in. long, oblong. *Calyx-lobes* sub-rotund, concave, minutely tomentose outside, sub-glabrous inside. *Petals* coriaceous, erect, oblong, concave, four times as long as the calyx, minutely pale tomentose on the back, the imbricate edges and inner surface glabrous. *Anthers* ovate, adnate, much shorter than the filaments. *Ovary* ovoid-globose, woolly, 2-celled, surrounded at the base by an annular disc: *style* long, cylindric, glabrous, 2-furrowed. *Fruit* ellipsoid, slightly obovoid, apiculate, striate, ·6 to ·75 in. long, minutely pale tomentose; the pericarp woody, splitting on one side when ripe. *Seeds* with an imperfect pectinate arillus. Masters in Hook. fil. Fl. Br. Ind. I, 579: Beccari, Malesia I, 120.

Malacca: Maingay (Kew Distrib.), No. 382. Perak: Scortechini, Wray, King's Collector.—DISTRIB. Borneo, Beccari, P. B., No. 2637, (*fide* Beccari). Sumatra: Forbes, 3002.

2. CTENOLOPHON GRANDIFOLIUS, Oliver in Trans. Linn. Soc. XXVIII, 517, t. 43, figs. 8 to 10. A tree; the young branches pale, sparsely lenticellate. *Leaves* oblong-elliptic, shortly acuminate, 3·5 to 5 in. long and 1·5 to 1·75 in. broad, otherwise as in *C. parvifolius*. *Panicles* terminal or axillary, almost as long as the leaves, more or less open and spreading, minutely rusty-tomentose; bracts scale-like, caducous; pedicels longer than the calyx. *Flowers* ·4 in. long. *Calyx* and *petals* as in *C. parvifolius*, but rufous- instead of pale-tomentose. *Ovary* as in *C. parvifolius*, but the ovarian cavity shorter. *Fruit* unknown. Masters in Hook. fil. Fl. Br. Ind. I, 577. Beccari, Malesia I, 120.

Malacca: Maingay (Kew Distrib.), No. 383.—DISTRIB. Borneo. P. B., No. 1966 (*fide* Beccari).

This species is much rarer than the last. In fact I have seen no other specimens than Maingay's. It closely resembles *C. parvifolius* Oliver., the only tangible differences that I can discover (in the absence of fruit of this), being the greater size of its flowers, and the colour of the tomentum of the flowers and inflorescence which in this is rusty, whereas in *C. parvifolius* it is pale. Professor Oliver relies as a diagnostic mark on a difference in the length of the ovarian cavity; the cavity of the ovary in *C. parvifolius* reaching nearly to the base of the style, whereas in *C. grandifolius* it occupies the base only of the ovary.

9. XIMENIA, Linn.

A shrub or low tree. *Branches* spiny. *Leaves* shortly petioled, alternate, simple, 1-nerved. *Flowers* racemose, usually hermaphrodite. *Calyx* cupular, 4- 5-toothed, persistent, not accrescent. *Petals* 4–5, oblong, revolute, hairy within. *Stamens* twice as many as the petals, hypogynous; *anthers* innate, linear, 2-celled. *Staminodes* 0. *Ovary* sessile, superior, 4-celled; *style* columnar, stigma simple; *ovules* solitary in each cell, pendulous, anatropous. *Drupe* ovoid, 1-celled; *stone* solitary.—DISTRIB. Species, 4–5, 1 Mexican, 1 South African, 1 Bornean, 1 Polynesian, 1 widely dispersed through the Tropics of both hemispheres.

1. XIMENIA AMERICANA, Linn. Sp. Pl. 1193. Glabrous, the young shoots striate and lenticellate. *Leaves* coriaceous, oblong-ovate to sub-orbicular, the apex emarginate, the base rounded; length 1 to 2 in., breadth ·75 to 1·25 in. *Racemes* short, axillary, or at the ends of short branches, few-flowered. *Flowers* hermaphrodite or polygamous, ·35 in. long; the buds oblong, acute, bracts minute. *Calyx* much shorter than the petals. *Anthers* linear, erect, the connective thick. *Ovary* ovoid-conical, glabrous. *Style* as long as the stamens. *Stigma* simple. *Fruit* oval, glabrous, about 1 in. long, orange-red when ripe, the pericarp pulpy; *endocarp* bony, 1-celled, 1-seeded. Lamk. Illust. 297, fig. 1; DC. Prod. I, 533; Roxb. Fl. Ind. II, 252; W. and A. Prod. 89; Blume Mus. Bot. Lugd. Bat. I, 247; Miq. Fl. Ind. Bat. I, Pt. 1, 786; Hook. fil. Fl. Br. Ind. I, 574; Pierre For. Flor. Coch. China, x. 265; Kurz For. Flora Burma I, 233; Valeton Olacineæ, 74. *X. Russelliana*, Wall. Cat. 6784.

Malacca, Singapore, Nicobar and Andaman Islands:—DISTRIB. Malayan Archipelago; Peninsular India.

10. SCORODOCARPUS, Beccari.

A tall tree. *Leaves* alternate, simple, penni-nerved. *Flowers* dichlamydeous, in short axillary racemes. *Calyx* small, cupular, 4-crenate, not enlarging with the fruit. *Petals* 4 or 5, hypogynous, narrow, valvate, coherent by their edges until mature, lanate internally. *Stamens* twice as many as the petals, attached to them in pairs, dehiscing suturally, the filaments shorter than the linear elongate erect anthers.

Ovary ovoid, grooved, imperfectly 4- or 5-celled, with 4 or 5 elongated pendulous ovules. *Style* simple, much longer than the ovary; *stigma* minutely-lobed, terminal. *Fruit* globose, 1-celled, the epicarp thin, fleshy, the endocarp crustaceous. *Seed* solitary, globular, pendulous from the apex by a filiform thread (? placenta), embryo near the apex of the fleshy albumen, radicle superior. One species; native of Malaya.

1. SCORODOCARPUS BORNEENSIS, Beccari in Nuovo Giorn. Bot. Ital. IX, 273. A tall very fœtid tree; branches dark-coloured, lenticellate. *Leaves* coriaceous, elliptic-oblong, acute, the base slightly cuneate or rounded; both surfaces glabrous, the reticulations transverse; main nerves about 5 pairs, curved, ascending, prominent beneath; length 5 to 6·5 in., breadth 2·5 to 3 in., petiole about ·75 in. *Racemes* under 2 in. long, puberulous, the flowers in clusters of 3 or 4. *Calyx* with wavy edge, nearly glabrous. *Buds* oblong; petals puberulous outside, ·3 to ·35 in. long. *Disc* 0. *Fruit* glabrous, 2 in. in diam. Valeton Olacineæ, 88. *Schmidelia fœtidissima*, Wall. Cat. 8064. *Ximinia borneensis*, Baillon Adansonia LXI. 271 (in part).

Singapore: Wallich, Ridley, King. Johore: Ridley. Perak: King's Collector.—DISTRIB. Borneo.

Rather a common tree, every part of which has a fœtid alliaceous odour. The wood is hard and durable, and is much prized for various purposes. This tree was collected by Wallich in Singapore, and he referred it to *Schmidelia*. The Wallichian specimens, however, were overlooked, and the plant was first described by Baillon from specimens collected by Signor Beccari in Borneo. Subsequently the latter Botanist founded for its reception, the genus *Scorodocarpus*. Its affinities are with *Ximenia*.

11. ANACOLOSA, Blume.

Shrubs or trees. *Leaves* alternate, petiolate, simple, penni-nerved. *Inflorescence* cymose, axillary. *Calyx* cup-shaped, 5–7-toothed, not accrescent. *Petals* 5–7, oblong, free, valvate, springing with the stamens from a hypogynous or perigynous disk. *Stamens* concealed in the cavity of the petals and slightly adnate to their bases, filaments glabrous, or pilose at the apex; *anthers* broad, innate, 2-celled, dehiscing longitudinally. *Ovary* imperfectly 2- 3-celled below, 1-celled above; *style* cylindric, the stigma shortly lobed; *ovules* 2 or 3, pendulous, the placenta central. *Fruit* drupe-like, with the disc persistent at its apex and the slightly accrescent calyx at its base; *stone* crustaceous, 1- or imperfectly 2-celled, with a single pendulous seed; *embryo* minute at the apex of fleshy albumen, radicle superior.—DISTRIB. 5 or 6 species, British Indian and Malayan.

Calyx and pedicels glabrous ... ... 1. *A. Griffithii.*
Calyx and pedicels minutely rusty-pubescent
  Leaves membranous; young branches glabrous, dark-coloured; anthers with a tuft of hairs in front ... ... 2. *A. puberula.*
  Leaves coriaceous; young branches thick with pale scurfy bark; anthers very hairy ... ... 3. *A. heptandra.*

1. ANACOLOSA GRIFFITHII, Masters in Hook. fil. Fl. Br. Ind. I, 580. A glabrous shrub or tree; young branches dark-coloured, glaucous. *Leaves* thickly membranous, ovate-lanceolate, sub-acute or acute, the base rounded or sub-cuneate; main nerves 5 or 6 pairs, obscure on both surfaces, curved, spreading; length 2·5 to 4 in., breadth 1·2 to 1·5 in., petiole ·35 in. *Cymes* axillary, few-flowered, sessile or very shortly pedunculate; pedicels longer than the flowers, angled, ebracteolate, glabrous. *Flower-buds* sub-globose. *Calyx* cupular, minutely 5-or 6-toothed, glabrous. *Petals* two or three times longer than the calyx, oblong, obtuse, the upper half thick and fleshy, the lower half concave, hairy towards its upper part, otherwise glabrous. *Stamens* embedded in the concavities of the petals, the filaments short, slender; the anthers sub-globular, hairy in front. *Ovary* conical, flocculent-hairy, tapering into the glabrous style, surrounded at the base by the annular fleshy disk. Kurz For. Flora Burma I, 236; Valeton Olacineæ, 92; Pierre For. Flor. Coch. Chine, t. 266 B.

Burma: doubtfully in the Andaman Islands.

I have seen no specimen of this from the Andamans, but I include it on the authority of the Flora of British India.

2. ANACOLOSA PUBERULA, Kurz in Jour. As. Soc. Bengal, 1872, Pt. 2, p. 297. A large shrub; young branches glabrous, dark-coloured, all parts except the inflorescence glabrous. *Leaves* membranous, oblong-lanceolate, the apex more or less acute, the base slightly narrowed; main nerves 3 to 5 pairs, distant, ascending, pale and prominent on the lower, faint on the upper surface; length 3·5 to 5·5 in., breadth 1·5 to 2 in., petiole ·3 in. *Cymes* few- or many-flowered, axillary, about as long as the petioles, their rachises conical, woody: pedicels ebracteolate. *Calyx* cupular, with 6 minute distant teeth, rusty-pubescent outside like the pedicels. *Petals* 6, in pairs, oblong, the upper half fleshy; the lower half concave, glabrescent externally, glabrous internally except for a tuft of long hairs at the apex of the concavity. *Stamens* opposite to and as many as the petals, hidden in their concavities; the filaments shorter than the anthers, broad, flat; *anthers* broadly ovoid, tufted, hairy; *disc* large, crenulate, surrounding the base of the conical sub-

glabrous ovary; *stigma* small, minutely lobed. *Fruit* ovoid, glabrescent, ·6 in. long, with the persistent disc at its apex and the slightly accrescent calyx at its base. Kurz For. Flora Burma I, 235: Valeton Olacineæ 93.

Nicobar Islands, Kurz.

Var. *Andamanica.* Leaves ovate-elliptic or ovate-lanceolate, main nerves 4 to 6 pairs, spreading, not pale underneath.

Andaman Islands: King's Collectors.

The specimens on which Kurz founded this species are in the Calcutta Herbarium. They were collected in the Nicobar Islands although Kurz, by a slip, attributes them to the Andamans. These Nicobar specimens are distinguished from all which have, since Kurz's time, been collected in the Andamans (where the plant is very common) by the smaller number of nerves in the leaves, which are, moreover, ascending and pale beneath, whereas these from the Andamans have more numerous nerves which are spreading and are not pale beneath.

3. ANACOLOSA HEPTANDRA, Maing. MSS. ex Hook. Fl. Ind. I, 581. A shrub or tree; young branches stout, with pale scurfy bark. *Leaves* coriaceous, oblong-lanceolate, sub-acute at base and apex, glabrous; main nerves 5 or 6 pairs, ascending, obsolete on the upper, rather prominent on the lower surface; length 6 or 7 in., breadth 2·25 to 3 in., petiole ·3 in. *Flowers* in crowded axillary cymes not much exceeding the petioles; *pedicels* short, rufous-pubescent like the calyx, ebracteolate. *Calyx* cupular, with 6 minute distant teeth. The other parts of the Flower as in *A. puberula*, but the ovary narrower, and the anthers more hairy, not merely tufted with hairs. Valeton Olacineæ, 93.

Malacca; Maingay (Kew Distrib.), No. 368.

This species of which I have seen only two specimens (neither of which is in fruit) comes very near to *A. puberula.* The young branches however, are thicker, with paler bark, and have the anthers more hairy than in that species.

12. PLATEA, Blume.

Trees. *Leaves* entire, coriaceous. *Male flowers* in short axillary interrupted-glomerulose spikes; the females in shorter cymes. *Flowers* polygamo-diœcious. *Sepals* 5, distinct, imbricate, small. *Petals* 5, united below into a tube, the teeth valvate; in the female deciduous or absent. *Stamens* 5, alternate with the petals and inserted at their bases; the filaments short, *anthers* ovoid, 2-celled. *Ovary in the female flower* cylindric, oblong, obtuse, crowned by the large discoid stigma, 1-celled; the ovules 2, pendulous. *Drupe* baccate, the endocarp woody.

Seed pendulous, the embryo straight, in the axis of the copious albumen.—DISTRIB. about 4 species; all Malayan.

1. PLATEA EXCELSA, Blume Bijdr. 646. A tree 50 to 100 feet high; young branches slender, softly rusty-puberulous. *Leaves* thinly coriaceous, elliptic to oblong, acute or shortly acuminate, the base rounded or very slightly narrowed; upper surface sparsely rufous, puberulous at first, afterwards almost glabrous; lower minutely cinereous-lepidote; reticulations minute, rather distinct and puberulous on both surfaces; main nerves about 7 pairs, spreading, curved, puberulous; length 4·5 to 7 in., breadth 1·75 to 3·5 in., petiole ·5 to ·75 in. *Female flowers* in axillary, 7-or 8 flowered, shortly pedunculate, pubescent, axillary cymes ·5 in. long. *Sepals* ·5 in., broadly ovate, acute, pubescent externally. *Petals* none or early deciduous. *Ovary* cylindric, puberulous; *ovule* (only 1 seen) pendulous, much elongate. *Fruit* narrowly ovoid-ellipsoid, tapering much to the apex, the base rounded 1 to 1·3 in. long, and ·5 in. in diam.; when ripe the pericarp yellowish, thin, glabrous; *endocarp* bony with a few short furrows, *seed* much attenuate at the upper end. Miq. Fl. Ind. Bat. I, pt. 1, 793: Beccari Malesia I, 116: Valeton Olacineæ, 253.

Perak: King's Collector, Wray. Penang: King's Collector, No. 1302. DISTRIB.—Java.

13. GOMPHANDRA, Wall.

Shrubs or trees. *Leaves* alternate, petioled, simple, penni-nerved, (rarely triple-nerved at the base). *Flowers* polygamo-diœcious, cymose, (practically unisexual). *Calyx* minute, cupular, 4- 5-toothed. *Petals* 4 or 5, sometimes united and 4-or 5-cleft; often absent in the female flower. *Stamens* 4 or 5, hypogynous, alternate with the petals; *filaments* thick, flattened, hollowed in front, and attenuate at the apex; *anthers* rather small, pendulous from the apices of the filaments, 2-lobed, the dehiscence longitudinal. *Hypogynous disc* thick, annular, or absent. *Male flower* with rudimentary ovary sunk in the fleshy disc, the stigma minute. *Female flower* with long cylindric ovary and large discoid stigma, 1-celled (2-celled in two species), the ovules 2, collateral, pendulous from the apex, the funicle dilated. *Fruit* elongate, drupelike, surmounted by the remains of the stigma; *pericarp* smooth, thin, *endocarp* leathery. *Seed* solitary, pendulous; *albumen* fleshy, bi-partite; *embryo* minute.—DISTRIB. 8 or 10 species; Tropics of Asia.

Flowers 4-merous.

Filaments with a large tuft of long white glandular hairs on both surfaces near the apex ... ... 1. *G. comosa.*

Filaments with a few white hairs on the posterior surface.
Cymes axillary or terminal ... 2. *G. lanceolata.*
Cymes extra-axillary or leaf-opposed ... 3. *G. penangiana.*
Flowers 5-merous.
Filaments hairy near the apex.
Cymes on stout short peduncles, ovary hairy, fruit ·8 in. long ... ... 4. *G. nyssifolia.*
Cymes on slender peduncles, ovary glabrous
Pedicels of cymes less than half the length of the leaves; fruit ·25 to ·5 in. long ... ... 5. *G. Maingayi.*
Pedicels of cymes half as long as the leaves; fruit ·65 in. long, imperfectly 2-celled ... ... 6. *G. gracilis.*
Filaments quite glabrous ... ... 7. *G. andamanica.*

1. GOMPHANDRA COMOSA, King, n. sp. A glabrous tree or shrub, young branches cinereous. *Leaves* thinly coriaceous, oblong to elliptic-oblong, shortly acuminate, much narrowed at the base; main nerves 6 to 8 pairs, sub-ascending, faint; length 3·5 to 6 in., breadth 1·5 to 2 in., petiole ·35 to ·6 in. *Cymes* on slender pedicels about as long as the petioles, umbellulate; cymules 3 to 5, each with 2 to 3 flowers. *Flowers* sessile, ·2 in. long, the buds obovate-globose. *Calyx* shallow, the edge wavy and obscurely 4- or 5-toothed. *Petals* 4, four or five times longer than the calyx, broadly oblong, obtuse, with an inflexed sub-apical point, glabrous. Connective and upper part of filament densely covered with long, white, glandular-pointed hairs. *Ovary* short, ovoid, conic, immersed in the fleshy annular disk, *style* short. *Fruit* narrowly ellipsoid, glabrous, vertically grooved, 1 in. long, and ·4 in. in diam., epicarp thin, endocarp cartilaginous, one-celled, 1-seeded.

S. Andaman; King's Collector's.—DISTRIB. Java.

The hairs on the filaments are white and very numerous, and they have conspicuous glandular apices. The ovary above described is that found in flowers bearing perfect anthers. It is probable that it aborts, and that fertile ovaries are confined to flowers (as yet undiscovered) in which the stamens are imperfect.

2. GOMPHANDRA LANCEOLATA, King. A shrub 5 or 6 feet high; young branches thin, puberulous. *Leaves* sub-coriaceous, lanceolate or oblong-lanceolate, sometimes very narrow, acuminate, the base cuneate; upper surface glabrous, the lower sparsely puberulous; main nerves about 5 pairs, spreading; the tips ascending, faint; length 2 to 6 in.,

breadth ·4 to 1·5 in., petiole ·15 to ·3 in. *Cymes* axillary and terminal, their pedicels several times as long as the petioles, usually 3, trichotomous; the cymules 3- to 10-flowered, pubescent or glabrescent. *Flowers* sessile, ·15 in. long, buds clavate with truncate apices. *Calyx* cupular, with 3 or 4 small obscure teeth. *Petals and stamens of the male flowers and female flowers* as in G. penangiana. *Lasianthera lanceolata*, Mast. in Hook. fil. Fl. Br. Ind. I, 585. *Stemonurus tomentella*, Valeton (not of Beccari) Olacineæ, 237.

Malacca: on Mount Ophir, Griffith. Perak: King's Collector, Wray, Scortechini, common.

This is rather a variable species as regards the form of leaf and the amount of pubescence on the inflorescence, but the characters of the flowers are constant. For two of the best-marked of these forms I propose varietal names as below.

Var. *angustifolia*, King: *leaves* narrowly oblong-lanceolate, 2 to 6 in. long, and ·4 to ·7 in. broad: *fruit* ovoid with a long apiculus, also contracted at the base, ·5 in. long. Wall. Cat. *Olacineæ*, No. 7570.

Singapore, Wallich. Penang, Curtis, Nos. 737 and 1265. Perak: Scortechini, King's Collector, No. 4211.

Var. *triplinervis*, the two lower lateral main nerves bold and continued nearly to the apex of the leaf.

Perak; Scortechini, No. 375.

3. GOMPHANDRA PENANGIANA, Wall. Cat. 7204. A glabrous or subglabrous shrub 3 to 8 feet high; young shoots thin, pale. *Leaves* shortly membranous, oblong, oblong-lanceolate or elliptic, shortly acuminate, the base cuneate; main nerves 5 to 9 pairs, spreading or ascending, slightly prominent; length 4·5 to 7 in., breadth 1·5 to 2·75 in., petiole ·25 to ·35 in. *Cymes* extra-axillary or leaf-opposed, pubescent, trichotomous, spreading, many-flowered, their peduncles longer than the petioles, erect. *Flowers* ·15 in. long, on short glabrous or pubescent pedicels. *Calyx* a shallow glabrous cup with 3 or 4 obscure broad teeth. *Corolla* in bud cylindric-clavate, the apex truncate, four or five times as long as the calyx, glabrous. *Petals* 4, oblanceolate (the apex inflexed), hyaline. *Filaments* flat, thick, tapering to each end, with a tuft of few long pale glandular hairs near the apex behind the insertion of the anther. *Rudimentary ovary* narrowly ovate, small, half-immersed in the deep fleshy lobed disk. *Cymes of female flowers* longer than the males, secund; *calyx* as in the male: *corolla* absent. *Ovary* elongate, cylindric, glabrous, crowned by a large discoid *stigma* wider than itself, one-celled with 2 elongated ovules pendulous from the apex. *Fruit* ovoid or elliptic, constricted at base and apex, vertically ridged, glabrous, crowned by the persistent stigma, ·5 to ·7 in. long. Masters in

Hook. fil. Fl. Br. Ind. I, 587. *Stemonurus penangianus*, Miers Contrib. I, 90; Kurz For. Flor. Burm. I, 238. Wall. Cat. 3718. *G. axillaris* (in part).

Penang; Wallich, Curtis. Perak; Scortechini, King's Collector, Wray; very common.

4. GOMPHANDRA NYSSIFOLIA, King. A tree 15 to 40 feet high; young branches dark-coloured, slightly winged under the nodes. *Leaves* coriaceous, elliptic-ovate, abruptly and shortly acuminate, the base cuneate; main nerves rather straight, ascending, prominent on the lower surface, the transverse veins distinct, ovary sub-horizontal; length 3·5 to 5·5 in., breadth 2 to 2·5 in., petiole ·3 in. *Cymes* axillary, sometimes 2 together, their pedicels shorter than or as long as the petioles; flowers 4 to 6, sessile, ·25 in. long. *Female flower*: calyx cupular, with 5 minute distant teeth or sub-entire; *petals* 5, puberulous outside, 5 or 6 times as long as the calyx. *Filaments* flat, with a few white short hairs just below the anther, especially in front. *Disk* adherent to the base of the ovary, glabrous. *Ovary* cylindric, as long as the petals, puberulous, crowned by the large discoid lobed stigma. *Fruit* ellipsoid, slightly clavate, glabrous, ridged, crowned by the persistent stigma, ·8 in. long, and ·35 in. in diam.

Perak: Scortechini, King's Collector, Nos. 6406 and 6984.

I have not seen the true male flowers of this species.

5. GOMPHANDRA MAINGAYI, King. A glabrous shrub 4 to 6 feet high; young branches rather stout, dark-coloured, glabrous. *Leaves* sub-coriaceous, oblong-lanceolate and acuminate, or sub-rhomboidal acute, the base cuneate; main nerves 5 or 6 pairs, rather straight, ascending, prominent beneath; length 2 to 3·5 in., breadth ·9 to 1·2 in., petiole ·25 in. *Peduncles* longer than the petiole, slender; *cymules* 2 or 3, umbellulate, each 4- to 5-flowered. *Flowers* ·15 in. long, sessile. *Calyx* cupular, tomentose, with 4 or 5 shallow teeth. *Petals* 5, four or five times as long as the calyx, rather thick, oblong, sub-acuminate, the apex inflexed, the midrib dark. *Filaments* pointed at the apex and with small tufts of long white sub-apical hairs; *anthers* pendulous from the apex of the filaments. *Rudimentary ovary* and disk absent. *Female flower* unknown. *Fruit* (*fide* Masters) ovoid, ·25 to ·5 in. long, 1-celled, 1-seeded. *Stemonurus Maingayi*, Valeton Olacineæ, 236. *Lasianthera Maingayi*, Mast. in Hook. Fl. Br. Ind. I, 585.

Malacca: Maingay (Kew Distrib.), No. 374^2. Penang: Curtis.

Known only by Maingay's and Curtis's scanty specimens. It is possible that under these there may really be two species: for Maingay's specimens divide themselves into two sets; one with sub-rhomboid acute leaves which bear the flowers described above; the other with narrowly oblong-lanceolate leaves and which have neither flowers nor fruit. It is possible that the second set belong to an undescribed species.

6. GOMPHANDRA GRACILIS, King, n. sp. A glabrous shrub or small tree; young branches thin, pale. *Leaves* membranous, lanceolate or ovate-lanceolate, acuminate, the base much narrowed, the edges slightly recurved when dry, wavy and sub-crenulate; main nerves 6 or 7 pairs, spreading, faint. *Peduncles* axillary and terminal, nearly half as long as the leaves; the cymes trichotomous, compound, the ultimate cymules umbellate. *Male flowers* ·1 in. long, the buds sub-globular; *Calyx* cupular, shallow, with 5 minute teeth; *petals* 5, oblong, glabrous, reflexed, 4 or 5 or 6 times as long as the calyx. *Filaments* 5, thin, flat, attenuate upwards, bearing a tuft of white bulbous-pointed hairs below the small anther. *Female flower* with calyx and abortive stamens like the male, the petals (if any) deciduous. *Ovary* long, cylindric, glabrous, crowned by the large pileate stigma, 2-celled, one of the cells usually empty, the other with a single long ovule suspended from its apex. *Fruit* ellipsoid, flat on one side, curved, glabrous, striate, about ·65 in. long, imperfectly 2-celled and with a single pendulous seed.

Perak: Wray, King's Collector; common.

A species readily distinguished by its small flowers globular in bud, and by its curved imperfectly 2-celled fruit.

7. GOMPHANDRA ANDAMANICA, King. A tree; young branches tawny-puberulous. *Leaves* thinly coriaceous, oblong or elliptic, shortly and rather abruptly acuminate, the base round or narrowed, sometimes oblique; main nerves 8 or 9 pairs, curved, ascending, prominent beneath and depressed above when dry; length 5 to 8 in., breadth 2 to 3 in., petiole ·4 to ·6 in. *Cymes* in the axils of leaves or of fallen leaves, often 2 together, ·5 to ·8 in. in diam., many-flowered, dense, rusty-pubescent, their peduncles stout and ·4 or ·5 in. long. *Flowers* nearly ·15 in. long, sessile, globose-obovate in bud. *Calyx* cupular, thin, irregularly and minutely 4-5-toothed, tomentose externally, and glabrous internally like the petals. *Petals* 5, oblong-oblanceolate, spreading, the apices curved, three times as long as the calyx. MALE FLOWERS: *stamens* 5, as long as the petals, free, the filaments quite glabrous; *disk* hypogynous, fleshy, embracing the base of the narrowly ovoid small rudimentary ovary. *Female flower:* calyx as in the male; petals and stamens not seen; *ovary* narrowly ellipsoid, with a short constriction at the apex, stigma disciform. *Fruit* compressed-ellipsoid, about 1 in. long, slightly convex on one side, deeply grooved on the other; the pericarp glabrous, vertically striate, thin; the endocarp leathery, 2-celled, one cell without a seed, and divided by vertical false dissepiments into several chambers, the other cell occupied by a single pendulous flat seed

bent vertically on itself at right angles. *Apodytes andamanica*, Kurz, Journ. As. Soc. Bengal, 1872, II, 296; Hook. fil. Fl. Br. Ind. I, 587.

Andaman and Nicobar Islands; Kurz. Narcondam Island; Prain.

This species was published as an *Apodytes* by Kurz. The stamens ovary and fruit however are exactly those of *Gomphandra*, to which genus I therefore transfer it. In *Apodytes* the stamens have long narrow anthers and short filaments, while the style is oblique and excentric, more or less curved, and the stigma small, the fruit being more or less orbicular or reniform with the scar of the stigma lateral.

14. LASIANTHERA, Pal. de Beauv.

Trees or shrubs, sometimes scandent. *Leaves* alternate, simple, penni-nerved, coriaceous. *Flowers* dichlamydeous, bisexual, in stalked axillary cymes. *Calyx* minute, cupular, 4- or 5-lobed. *Petals* 5, free or rarely cohering, the apex inflexed. *Stamens* 5, hypogynous, free, alternate with the petals; the filaments flat, broad, the connective dilated behind and bearing a tuft of long hairs curving over the anther in the bud; *anthers* adnate, 2-lobed, dehiscing lengthwise. *Hypogynous disk* cup-shaped, more or less corrugated. *Ovary* ovoid, 1-celled, tapering into a subulate style, terminated by a minute stigma; *ovules* 2, pendulous. *Fruit* drupaceous; *stone* fibrous outside, woody within. *Seed* pendulous; *embryo* in albumen, cotyledons leafy and broad, radicle superior.—DISTRIB. Species 4, one African, the others Malayan.

The genus *Stemonurus*, as originally constituted by Blume in 1825, contained three species. One of these has been referred by Messrs. Bentham and Hooker to the older genus *Lasianthera*, which was founded by Palisot-Beauvois in 1805; while the other two species of Blume, *viz.*, *S. parviflorus* and *S. javanica*, have been placed in the genus *Gomphandra* Wall. as defined by Lindley (Nat. Syst. Ed. II, p. 439).

This arrangement is not, however, accepted by all botanists who have written concerning these genera. Miers (Contrib. I, 80) for example considers *Gomphandra* Wall. and *Stemonurus*, Bl. as identical, and both as undistinguishable from *Lasianthera*, Pal-Beauv.; while Beccari (Malesia I, pp. 107, et seq.) keeps up all three genera, and in this, he is followed by Valeton (Olacineæ pp. 207, et seq.). M. Baillon, like Miers, includes the other two in *Lasiandra* which however he places in the natural family *Terebinthaceæ*. Dr. Masters (in Hooker's Flora of British India) follows Messrs. Hooker and Bentham, and I do so also. I have, however, modified the generic characters of *Lasianthera* and *Gomphandra*, and I have not followed Dr. Masters altogether in his allocation of the species. I find the best characters to distinguish *Gomphandra* from *Lasianthera* to be these:—*Lasianthera*, flowers truly hermaphrodite, stigma minute,—*Gomphandra* flowers practically unisexual, the stameniferous flowers having rudimentary ovaries and the seed-producing flowers having large cylindric ovaries with large discoid stigmas, and usually abortive stamens.

Ultimate branches of the inflorescence scorpoid cymules 1·5 in. or more in length ... 1. *L. secundiflora.*
Ultimate branches of the inflorescence about ·25 in. long.
  Leaves cuneate-obovate ... ... 2. *L. umbellata.*
  Leaves elliptic-oblong or elliptic-acuminate ... ... 3. *L. malaccensis.*

1. LASIANTHERA SECUNDIFLORA, Miq. Fl. Ind. Bat. I, Pt. I, 792; Suppl. 342, t. 2, pp. 43 and 403. A glabrous tree 40 to 60 feet high; young branches stout, dark-coloured. *Leaves* coriaceous, elliptic or ovate-elliptic, very shortly and bluntly acuminate or obtuse, the base rounded or narrowed; the midrib prominent on the lower surface, depressed on the upper; main nerves about 10 pairs, ascending, curving slightly, not much more prominent when dry than the secondary nerves and wide reticulations; length 5 to 10 in., breadth 2·25 to 4 in.; petiole ·5 to ·75 in., stout. *Peduncles* solitary, longer than the petioles, woody, each bearing at its apex an umbel of 6- to 9-flowered secund subscorpoid cymes. *Flowers* sessile, ebracteate, ·25 in. long. *Calyx* short, puberulous. *Petals* glabrous, four or five times as long as the calyx, oblong, sub-acute, each bearing a fleshy conical inflected process slightly below the apex. *Filaments* flattened, tapering to the base; the connective thick, bearing a dense tuft of white hairs as long as the stamen. *Ovary* furrowed, shorter than the stamens but longer than the style. *Fruit* narrowly ellipsoid, 2·5 in. long, and 1 in. in diam., tapering to each end, glabrous, vertically grooved; epicarp thin, mesocarp fibrous, endocarp thin and bony; embryo half as large as the albumen, cotyledons foliaceous, cordate, radicle superior. *Stemonurus secundiflorus*, Blume Bijdr. 649; Mus. Bot. Lugd. Bat. I, t. XLV; Beccari, Malesia, Vol. I, t. IV, figs. 16 and 17; Valeton, Olacinæ 234.

Singapore, Johore: Ridley. Perak: King's Collector, Wray. DISTRIB.—Java, Sumatra.

2. LASIANTHERA UMBELLATA, King. A glabrous tree 50 to 60 feet high (or a shrub *fide* Beccari); young branches cinereous, terete. *Leaves* coriaceous, cuneate-obovate, the apex rounded or slightly retuse, much narrowed to the base, midrib prominent beneath; main nerves 7 to 9 pairs, ascending, faint; length 2·5 to 3·5 in., breadth 1·25 to 1·8 in., petiole ·5 to ·7 in. *Cymes* longer than the petioles, umbellulate; the 4 to 6 cymules each with 4 or 5 flowers. *Flowers* sessile, ·15 in. long, broad, truncate. *Calyx* nearly half as long as the petals, pubescent, coriaceous, the edge with 5 broad rounded teeth. *Petals* subcoriaceous, elliptic, obtuse at each end and with an inflexed process below the apex, puberulous outside, glabrous inside. *Filaments* attenuated

towards the base. Connective of anthers everywhere densely silky-comose, the anther lobes separated. *Ovary* globose-ovoid, tapering into the short style, 1-celled. *Disk* thin, hyaline, enveloping the base only of the ovary. *Fruit* unknown. *Stemonurus umbellatus*, Beccari, Malesia, I, 115; tav. XV, pp. 5, 6. *Stemonurus intermedius*, Scort. MSS. in Herb. Calc.

Perak: King's Collector, Scortechini.—DISTRIB. Borneo.

3. LASIANTHERA MALACCENSIS, Mast. in Hook. fil. Fl. Br. Ind. I, 584. A glabrous tree 30 to 40 feet high; young branches cinereous, terete, glabrous. *Leaves* coriaceous, elliptic-oblong to elliptic, shortly and abruptly acuminate, the base narrowed, midrib prominent on the upper, depressed on the lower surface; main nerves about 10 pairs, straight, sub-ascending, faint on both surfaces; length 3 to 4·5 in., breadth 1·2 to 2·25 in., petiole ·3 or ·4 in. *Cymes* slightly longer than the petioles, dichotomous, 8- to 10-flowered. *Flowers* sessile, ebracteate, ·2 in. long. *Calyx* with 5 acute teeth, puberulous. *Petals* 3 or 4 times as long as the calyx, otherwise as in *L. secundiflora*. *Filaments* with a small tuft of hairs in front, otherwise as in *L. secundiflora*. *Fruit* unknown. *Stemonurus capitatus*, Beccari, Malesia, I, 114, tav. XV, figs. 7 to 11; Valeton, Olacineæ, 236.

Malacca: Maingay (Kew Distrib.), No. 385. Penang: Curtis, Nos. 912, 957. Perak: King's Collector, Scortechini.

This species has smaller leaves and different cymes from *L. secundiflora*, but the flowers of the two are very much alike.

15. GONOCARYUM, Miq.

Trees. *Leaves* alternate, simple, penni-nerved, coriaceous. *Flowers* in long axillary spikes, dimorphous. *Calyx* of 5 free, ovate, imbricate sepals. *Corolla* much longer than the calyx, gamopetalous, tubular, with 5 acute spreading short teeth, slightly inflexed at the very apex, and valvate in æstivation. *Stamens* 5, alternate with the teeth of the corolla, the filaments adherent to its tube, free only towards the apex; *anthers* sub-exserted, alternate with the teeth, oblong, bilocular, dehiscing longitudinally. *Ovary* ellipsoid, seated on the glabrous annular disk, minute, bilocular, the cells (unequal?), uniovulate, the ovule pendulous. *Style* 1, very short, the stigma apical. *Drupe* dry, spongy, 4-gonous, ridged, narrowed to each end, crowned by the small incurved style and stigma; the calyx persistent at its base but not enlarged, 2-celled, the obsolete second cell being represented by a cylindrical cavity in the spongy mesocarp; the epicarp membranous, sub-glabrous in its upper half, puberulous towards the apex; endocarp papery, with a few minute scattered hairs. *Seed* solitary, flattened, the abortive seed very small, both pendulous.

The genus *Gonocaryum* was first published by Miquel in his Fl. Ned. Ind. Suppl. p. 343, to receive the single species *G. gracile.* The generic description is incomplete as regards the structure of the seed, but the specimens with which the author worked have no seeds. I have had an opportunity of carefully examining these specimens and I find that Miquel's description is, as regards the structive of the ovary which is found in the staminferous flowers, inaccurate. He describes two styles and stigmas, whereas, I can find only one of each. And to this extent, I have modified as above the generic description. I think it highly probable however, that fertile ovaries occur (as in so many members of this family) in distinct flowers, and that these may possibly have two stigmas like *Pteleocarpa* and *Cardiopteris.* Of such flowers however, there is no trace in the scanty materials on which Miquel founded the genus. There are two fruits however on one of the type specimens, and a transverse section of these shows a vertical cavity in the substance of the thick mesocarp on one side which has all the appearance of an aborted loculus. The single perfect seed which has filled the loculus, is too much decomposed for examination. In their *Genera Plantarum*, Messrs. Bentham and Hooker remark (in a note), that they have seen no specimen of *Gonocaryum* Miq. And without admitting it as a genus of *Olacineæ*, they quote Miquel's genera description. The late Mr. S. Kurz, in a note in Journ. As. Soc. Bengal for 1870, Pt. 2, p. 72, propounded the view that *Phlebocalymna* Griff. MSS., as described by Messrs. Bentham and Hooker (Genera Plantarum I, 353) is identical with *Gonocaryum.* Kurz, who had examined the specimens on which Miquel founded *Gonocaryum*, also believed Miquel to be wrong about the cells of the ovary; for he states that "the ovary is really one-celled and, to judge from the sterile fruits, 2-ovuled." The abortive seed in the fruit which Kurz examined was, he continues "suspended from the apex just beneath the acumen, and there can be observed also the rudiment of the second superposed ovule." But Kurz entirely overlooked the cylindrical cavity of the abortive loculus. Dr. Scheffer in (Ann. Jard. Bot. Buitenzorg I, 96), published a note on the genera *Gonocaryum* and *Phlebocalymna*, of neither of which had be seen (as he states) good or authentic specimens. In that paper Dr. Scheffer follows Kurz in reducing *Phlebocalymna* to *Gonocaryum.* Scheffer gives also a definition of *Gonocaryum* which differs a good deal from Miquel's. And he describes two new species of this modified *Gonocaryum* (viz., *G. Teysmannianum* and *G. pyriforme*). I have examined the latter, and I do not find it to be a *Gonocaryum* at all, as Miquel defined the genus. Beccari (Malesia I,

122) follows Scheffer, adopts his modified definition of *Gonocaryum*, and adds two new species *viz.*, *G. Selebicum*, and (at p. 256), *G. affine.* In my opinion *Gonocaryum* and *Phlebocalymna* are not identical.

The flowers of the two species *P. Griffithiana* and *P. Lobbianum* (which are accepted as constituting the genus *Phlebocalymna*) have the calyx gamosepalous, deeply 5-lobed, the petals only twice as long as the calyx, fleshy, cohering by their edges, but quite separable from each other, their apices fleshy and inflexed ; the buds being shortly cylindrical and obtuse, and the fruit elliptic (not 4-gonous), slightly striate, obtuse at each end with a bony (not spongy) and strictly 1-celled endocarp, and there being no trace whatever of an abortive loculus. If the definition of the genus *Phlebocalymna* be amended in these particulars to it certainly belongs *G. pyriforme*, Scheff. And, judging from the description, (for I have not seen specimens) *G. Teysmannianum* Scheff. and *G. Selebi* Becc., with almost equal certainty belong to *Gonocaryum*. About the allocation of *G. affine*, Becc., the description in Malesia I, 256, is too incomplete to enable me to form an opinion.

Racemes 5 to 12 in. in length, flowers ·2 in. long. ... ... 1. *G. longe-racemosum.*
Racemes under 3 in. long : flowers ·1 in. long 2. *G. gracile.*

1. GONOCARYUM LONGE-RACEMOSUM, King, n. sp. A small glabrous tree. *Leaves* coriaceous, elliptic-oblong, shortly acuminate, the base slightly narrowed ; main nerves about 4 pairs, ascending, prominent on the lower, depressed on the upper surface, length 5 to 7 in., breadth 2·25 to 3·5 in., petiole ·3 to ·5 in. *Racemes* axillary or from the stem and larger branches, puberulous, slender, 5 to 12 in. long. *Flowers* ·2 in. long, irregularly disposed on the rachis, sometimes in pairs ; their pedicels ·1 in. long, pubescent. *Sepals* 5, ovate, imbricate, puberulous. *Corolla* tubular, the teeth small and recurved. *Fruit* obovoid-elliptic, with 4 very bold vertical ridges and numerous striæ, 1·5 to 2 in. long, and 1 in. in diam., glabrescent ; *mesocarp* very thick, spongy, distinctly 2-celled, the aborted cell narrowly cylindric.

Singapore ; Hullett, No. 851 ; Ridley, No. 4750. Perak ; King's Collector, Nos. 7397, 7663 ; Scortechini.

2. GONOCARYUM GRACILE, Miq. Fl. Ind. Bat. Suppl. 343. A shrub ? *Leaves* as in the last, but slightly obovate. *Racemes* under 3 in. in length, and the flowers only about ·1 in. long, fruit 1·5 in. long. Kurz in Journ. As. Soc. Beng. for 1875, II, 155 ; For. Flora Burma, I, 240. *G. Wallichii*, Mast. Fl. Br. Ind. I, 590 ; Beccari, Malesia, I, 122 ; Valeton Olacineæ, 245 : *Platea Griffithiana*, Miers Contrib. I, 97, (*not Phlebocalymna*, Griff). *Gonocaryum ? Wallichii*, Mast. in Hook. fil. Fl. Br. Ind. I, 590 (note).

Andamans or Tenasserim; *Helfer* (Kew Distrib.), No. 817.—Distrib. Sumatra; Lebong Moesie, Teysmann.

I include this species here although it is not clear whether Helfer's specimen was collected in the Andamans or in the Tenasserim Province of Burmah. This differs from *G. longe-racemosa* by its shorter more slender racemes, and much smaller flowers. Other differences will no doubt be found when both plants are properly collected. At present the materials of *S. gracile* are very poor indeed. They are, however, sufficient to demonstrate that the plant so long known as *Phlebocalymna Griffithii* does not belong to the same genus as the specimens on which Miquel founded his genus *Gonocaryum*.

16. Phytocrene, Wall.

Climbing shrubs, usually more or less hairy, often prickly; wood with very large porous vessels and thick medullary rays, but no annual rings. *Leaves* alternate, petiolate, entire or palmately-lobed. *Flowers* diœcious, monochlamydeous; male in small globose clusters borne on long branching spikes; female in large solitary globose pedunculate heads. *Male flowers* each with an involucre of 3–5 free pieces; the perianth single, of 4 pieces, free, or united below and deeply 4-lobed, valvate. *Stamens* as many as the pieces of the perianth and alternate with them, the filaments hypogynous; *anthers* 2-celled, introrse, dehiscing longitudinally; *pollen grains* globose, the rudimentary pistil small. *Female flowers* without involucels; the perianth as in the males, more or less persistent in the fruit; *staminodes* minute, tooth-like, as many as the pieces of the perianth, or absent. *Pistil* sessile, 1-celled, villous; *style* thick, tapering; *stigma* large, sub-capitate or discoid, lobed or emarginate; *ovules* 2, collateral, suspended from near the apex of the cavity, raphe dorsal, *micropyle* superior. *Drupes* many, in globose heads, bristly or echinate; *stone* hard, 1-celled, 1-seeded, pitted externally. *Seed* pendulous; *embryo* as long as the fleshy albumen; radicle superior, short; cotyledons large, flat, appressed.—Distrib. Species 8, all natives of India and the Malayan Archipelago.

There is a difference of opinion as to the nature of the organs at the base of the flowers, some authors regarding them as a calyx, while others (e. g. Baillon) regard them as bracteoles. I adopt the latter view, chiefly because these bodies are not isomerous with the inner whorls of the perianth (corolla of some) or with the stamens. A further argument for considering them as bracteoles is found in the allied genus *Miquelia*, in the males of which similar organs are found, and where they are separated from the flower by a long pedicel.

Leaves entire ... ... 1. *P. oblonga.*
Leaves ovate, sometimes 3-lobed ... 2. *P. bracteata.*
Leaves deeply palmately 5-lobed ... 3. *P. palmata.*

1. PHYTOCRENE OBLONGA, Wall. Pl. As. Rar. III, 12. Bark brownish, rather rough, striate, not prickly, that of the younger branches puberulous. *Leaves* coriaceous, oblong or oblong-lanceolate, more or less acuminate, entire, the base narrowed; upper surface glabrous, shining, the lower minutely pubescent, minutely lepidote, the reticulations very distinct; main nerves 7 to 9 pairs, curved, ascending, prominent on the lower surface; length 4·5 to 9 in., breadth 2 to 3·5 in., petiole ·6 to 1 in. *Panicles of male flowers* axillary, or clustered on woody warted tubercles on the stem and larger branches, 1 to 2 in. long, and from ·4 to ·5 in. broad, the ultimate branches consisting of minute pedicellate umbellules; the pedicels of the umbellules ·15 in. long, rusty-tomentose, each with a subulate bract shorter than itself. *Flowers* sessile, ·05 in. long, in 4- or 5-flowered umbellules ·15 in. in diam. *Bracts of involucel* free, narrowly deltoid, rufous-sericeous. *Pieces of the perianth* 4, free, ovate, concave, glabrous inside, rufous-sericeous externally. *Stamens* shorter than the perianth, anthers broad. *Rudimentary ovary* minute, sericeous. *Female flowers* in shortly pedunculate globular capitula, ·5 in. in diam., borne on the stem and branches, the peduncle stout, ·25 in. long. *Drupes* cuneate-ovoid, obtuse, 1·5 in. long, and 1 in. in diam.; the base pointed trigonous and strigose; the rest of the surface densely covered with very stout asperulous pale brown bristles, collected in globular heads, the size of a cricket-ball; epicarp leathery, mesocarp pulpy, endocarp crustaceous. *Seed* solitary; cotyledons thin, tortuous, embedded in lobulated fleshy albumen. Baill. in DC. Prod. XVII, 13; Hook. fil. Fl. Br. Ind. I, 592; Wall. Cat., No. 4948. *Gynocephalum oblongum*, Trec. in Ann. Sc. Nat. Ser. 3, VIII, 149.

Penang; Wallich. Malacca; Maingay. Perak; Scortechini, King's Collector.

The female flowers are often diseased, and the petals are converted into a long fleshy tube which contains no trace of ovary.

2. PHYTOCRENE BRACTEATA, Wall. Pl. As. Rar. III, 12. Stems with sharp tubercles; branches striate, minutely prickly when young. *Leaves* coriaceous, broadly ovate, cordate at the base, often 3-lobed and obscurely dentate, the apex acute, upper surface glabrous, the nerves pubescent; lower surface pale, softly and minutely pubescent, reticulations distinct especially on the lower surface; main nerves 4 or 5 pairs, spreading, curved, prominent beneath; length 4 to 8 in., breadth 3 to 5·5 in.; petiole 1·25 to 3 in., minutely tomentose with bristles intermixed. *Panicles of male flowers* bracteate, axillary, 4 to

8 in. long, and from ·75 to 1·25 in. broad; the ultimate branches consisting of minute clustered, 6- to 10-flowered, pedicellate umbellules; *bracts* from the bases of the pedicels of the umbellules, ·4 or ·5 in. long, subulate, curved, hispid. *Flowers* sessile, ·05 in. in diam. *Bracteoles of the involucel* 3, deltoid, their apices broad and bifid, glabrous on the inner, densely villose on the outer surface. *Pieces of the perianth* 4, free, ovate-lanceolate, acute, smaller than the sepals, valvate. *Stamens* shorter than the perianth, the anthers broad. *Rudimentary ovary* minute, villous. *Female flowers* (*fide* Griffith) in oblong or spherical pedunculate capitula of which there are several in a leaf-axil. *Style* short, tri-partite; the segments revolute, stigmatiferous on the inner surface. *Ovary* strigose, 1-celled, with 2 pendulous ovules. *Drupes* ovoid, tapering to each end, densely covered with adpressed yellowish bristles, 1·5 in. long, and ·75 in. in diam., 1-celled, crowded in dense pendulous globose capitula as large as a man's head. *Seed* solitary, albumen fleshy, radicle broad; cotyledons small, orbicular. Baill. in DC. Prod. XVII, 12; Hook. fil. Fl. Br. Ind. I, 592; Kurz For. Flora Burmah I, 242; Beccari Malesia, I, 127: Wall. Cat. No. 4947. *P. macrocarpa*, Griff. Notul. IV, 322: Ic. Pl. Ind. Or. 487 and 488. *Gynocephalum bracteatum*, Trec. in Ann. Sc. Nat. Ser. 3, VIII, 149, No. 3.

Penang; Porter, Curtis. Malacca; Griffith. Perak; King's Collectors. Singapore; Maingay, Ridley.—DISTRIB. Borneo.

3. PHYTOCRENE PALMATA, Wall. Pl. As. Rar. III, 12. Stem minutely prickly; the younger branches rufous-hispid, striate. *Leaves* coriaceous, reniform, deeply 5-lobed; the lobes oblong, acuminate or acute; upper surface glabrous, the lower densely covered with soft course rufous or yellowish hairs; main nerves 5 to 7, palmate, prominent on the upper, depressed on the lower surface; length 7 to 12 in., breadth about the same; petioles 3 to 5 in., densely ferruginous-pilose. *Panicles of male flowers* axillary, 2·5 to 13 in. long, and about 1·5 in. broad, the ultimate branches consisting of minute 12- to 15-flowered, pedicelled, ebracteate umbellules; pedicels ·15 in. long, softly pubescent. *Male flowers* as in *P. oblonga*. *Female flowers* in shortly pedunculate axillary ovoid capitula, ·5 in. in diam.; the peduncle ·25 in. long, pilose. *Flowers* ·2 in. long, sessile. *Bracteoles of the involucel* of two deltoid bifid pieces: *corolla* 0. *Ovary* ovoid, pointed, densely hirsute. *Drupes* numerous, ellipsoid, slightly obovoid, tapering much to the base, the apex acute, the whole surface more or less densely covered with yellowish shining stiff hairs; 1·5 to 2 in. long, and ·75 in. in diam., collected in sub-globular heads 3 or 4 in. in diam., Baill. in DC. Prod. XVII, 11; Miq. Ann. Mus. Lugd. Bat. III, 248; Hook. fil. Fl. Br. Ind. I, 592; Beccari Malesia, I, 127. *Gynocephalum palmatum*, Trec. in Ann. Sc. Nat. Ser. 3, VIII, 149: Wall. Cat., 4949.

Penang; Wallich, Curtis. Malacca; Griffith. Perak; King's Collector, Wray.

17. MIQUELIA, Meissner.

Climbing shrubs, the wood with large vessels. *Leaves* alternate, simple, entire or dentate, petiolate, penni-nerved. *Flowers* diœcious, the males pedicellate and in clustered umbels, the females sessile and in solitary capitula. *Male flowers* each on a long pedicel with a whorl of minute bracteoles at its base. *Perianth* 5-merous, the pieces oblong or lanceolate, free or united at the base, valvate. *Stamens* equal to the pieces of the perianth and alternate with them; filaments short, anthers linear-oblong, 2-celled, introrse, disk 0. *Rudimentary pistil* small. *Female flowers*;—bracteoles as in the male, sometimes united by their bases. *Flowers* sessile, the perianth deeply divided into 4 fleshy lanceolate reflexed segments. *Disk* none. *Ovary* solitary, compressed, crowned by the large discoid stigma, 1- celled, with 2 pendulous collateral ovules, raphe dorsal, radicle superior. *Drupe* oblong, more or less compressed, the calyx persistent at its base, the mesocarp thin; the endocarp crustaceous, rugose externally, often verrucose internally. *Seed* suspended, solitary, with thin testa, albumen fleshy rugulose, radicle superior; cotyledons elliptic, thick, leafy. Species about 5 Indian and Malayan.

1. MIQUELIA CAUDATA, King, n. sp. A slender climber 10 to 20 feet long; branches thin, pale, striate. *Leaves* membranous, oblong-lanceolate, shortly acuminate, the base narrowed; upper surface glabrous, the lower puberulous especially on the midrib and 5 or 6 pairs of spreading, curving, ascending or spreading main nerves; length 5 to 8 in., breadth 1·5 to 2 in., petiole ·5 to ·65 in. *Umbels of male flowers* ·65 to 1 in. long, in fascicles from pilose tubercles on the stem, axillary or extra-axillary. *Bracteoles of involucel of each flower* 4 or 5, free or united at the base, lanceolate, pilose. *Pedicels of flower* ·15 to ·2 in. long, pubescent. *Flowers* ·15 in. in diam., the segments of the perianth spreading, puberulous; *filaments* shorter than the linear-oblong sagittate anthers. *Rudimentary ovary* minute, hirsute. *Capitules of female flowers* ·25 in. long, ovoid, solitary, axillary; their peduncles 2 to 2·5 in. long, puberulous. *Flowers* sessile, ·15 in. in diam.; perianth leathery, glabrous. *Ovary* tomentose; the stigma discoid, depressed in the centre, wider than the ovary, glabrous. *Drupe* broadly ovoid, slightly compressed, rounded and broad at the base, tapering upwards into a long terminal tail crowned by the persistent stigma; epicarp thin, rusty-pubescent on the surface; endocarp bony, rough, and pitted on the outer surface, smooth and tubercled on the inner; length from base to apex 1 to 1·25 in., breadth at base ·6 in.

Perak; Scortechini, King's Collector.

This species is closely allied to *M. Kleinii*, which is a common plant in the forests at the base of the Assam Hill Ranges. This differs from *M. Kleinii* chiefly in its fruit having a long apical tail which is quite absent in the former. The male flowers also differ in the two species. The genus *Miquelia* was founded by Meissner (*Plant. Vasc. Genera*); but Griffith, over-looking Meissner's description, published *M. Kleinii* under the name *Jenkinsia Assamica*, in 1844, in the Calcutta Journal of Natural History, Vol. 4. 231, t. 12. A description and figure of the female flowers are to be found in the same author's *Notulæ*, 370; and a figure in his Icones, t. 537, fig. 2. Wallich issued the Assam plant as No. 6760 of his Catalogue under the name *Zanonia ? oblonga*.

18. SARCOSTIGMA, W. and Arn.

Climbing shrubs. *Wood* without zones. *Leaves* alternate, simple, shortly petioled, much reticulate *Flowers* diœcious, minute, arranged in glomeruli along a long pendulous rachis. MALE fl.: *Calyx* minute, cupular, 4–5 lobed. *Petals* 5, free, or nearly so, valvate, oblong, ultimately reflexed. *Stamens* 5, alternate with the petals, free, or adnate to the base of the petals, filaments glabrous; *anthers* ovate, sagittate, erect, 2-celled, dehiscing longitudinally. *Pistil* rudimentary. FEMALE fl.: *Calyx* and *corolla* as in the male, but shorter and more fleshy. *Staminodes* 4–5, hypogynous, alternate with the petals. *Ovary* superior, sessile, 1-celled; *stigma* sub-sessile, discoid or umbonate; *ovules* 2, collateral, pendulous, funicle thick. *Drupe* oblong, more or less compressed, surrounded at the base by the persistent calyx and corolla; *epicarp* coriaceous; *endocarp* woody, lined with a thin white membrane. *Seed* (according to Baillon) pendulous, exalbuminous; *cotyledons* fleshy, wrapping round the short superior radicle.—DISTRIB. Species 3 or 4, all tropical Asiatic.

SARCOSTIGMA WALLICHII, H. Brongn. in Adansonia, X, 282. A powerful climber; young branches pale, puberulous at first, afterwards glabrous like all the other parts except the inflorescence and fruit. *Leaves* coriaceous, shining, much reticulate, oblong to broadly ovate, acute, the base narrowed, under surface sometimes sparsely pubescent; main nerves 5 to 7 pairs, much curved, ascending; length 4 to 7 in., breadth 1·5 to 4·5 in., petiole ·4 to ·6 in. *Spikes of male flowers* axillary or extra-axillary, solitary or in fascicles, often nearly as long as the leaves, softly rufous-tomentose; *flowers* ·1 to ·15 in. long, sessile. *Calyx* a membranous, obscurely-toothed cup, rufous pubescent outside, glabrous inside. *Petals* about four times as long as the calyx, lanceolate, spreading, slightly united at the base, the apices inflexed, pubescent outside, glabrous inside. *Stamens* shorter than the petals, filaments glabrous. *Rudimentary ovary* ovoid, obtuse, pubescent. *Disk* none. *Female flowers* not seen. *Drupes* ovoid or globular-ovoid, compressed, 1·25 in. long and ·75 in. in diam.; *pericarp* leathery, densely rusty-tomentose; *mesocarp* pulpy, rather copious; *endocarp* thinly bony, smooth on both surfaces. Baillon in DC. Prod. XVII, 16; Hook. fil. Fl. Br. Ind. I, 594; *S. edule*, Kurz, For. Flora Burmah I, 242. *Chailletia edulis*, Wall. Cat. 9030 ("indetermin.") Kurz in Andaman Report, App. 6.

S. Andaman; Kurz, King's Collector.—DISTRIB. Burmah.

Kurz himself (in Herb. Calcut.) reduced his species *S. edule* to S. Wallichii Baill., and there is no doubt the reduction is right.

19. IODES, Blume.

Climbing shrubs, rarely erect. *Leaves* opposite, or sub-alternate, petiolate, simple, penni-nerved. *Inflorescence* cymose, cymes axillary or extra-axillary; lower peduncles often sterile, cirrose. *Flowers* dichlamydeous, diœcious. MALE fl.: *Calyx* minute, cup-shaped, 5-toothed. *Corolla* 5-merous, lobes valvate. *Stamens* hypogynous, equal in number to, and alternate with the lobes of the corolla; *anthers* basifixed, straight, 2-celled, introrse, dehiscing longitudinally. *Pistil* rudimentary. FEMALE fl.: *Calyx* as in the male. *Corolla* 5-parted, the segments united below. *Staminodes* 0. *Ovary* sub-sessile, 1-celled, with 2 collateral pendulous ovules; *stigma* sessile, discoid. *Drupe* surrounded at the base by the persistent, but not accrescent calyx; *stone* 1-seeded. *Seed* pendulous, testa thin, albumen fleshy; *cotyledons* flat, leafy; *radicle* superior.—DISTRIB. Species about 8, natives of India, the Malayan Archipelago and tropical Africa.

Flowers 4-merous ... ... 1. *I. reticulata.*
Flowers 5-merous.
Calyx cupular with 5 minute teeth ... 2. *I. velutina.*
Calyx deeply divided into 5 lanceolate lobes.
Leaves ovate to rotund, pubescence rufous ... ... 3. *I. ovalis.*
Leaves oblong or oblong-lanceolate; pubescence cinereous ... ... 4. *I. oblonga.*

1. IODES RETICULATA, King, n. sp. A woody creeper 20 or 30 feet long; young branches slender, striate, with a broad line of tomentum on one side, changing sides at the nodes. *Leaves* thinly coriaceous, elliptic or broadly ovate, sometimes slightly obovate, shortly acuminate, narrowed slightly to the rounded or sub-emarginate base; both surfaces minutely but boldly reticulate, the upper glabrous, the lower with long soft hairs especially on the midrib and nerves; main nerves 4 or 5 pairs,

curving, ascending, prominent beneath as are the transverse nervules; length 2 to 5 in., breadth 1·3 to 2·5 in., petiole ·4 to ·6 in. *Cymes* both of male and female flowers terminal and extra-axillary, or occasionally axillary, usually much longer than the leaves, much-branched, and sometimes bearing tendrils, softly olivaceous-pubescent; pedicels longer than the flowers. *Male flowers* less than ·05 in. long, 4-merous, globular in bud. *Calyx* shorter than the corolla, with 4 acute segments, densely pilose outside. *Corolla* with 4 broadly ovate concave lobes, pilose outside and glabrous inside. *Stamens* shorter than the corolla, *anthers* broadly ovate, *rudimentary ovary* minute. *Female flowers* like the males but larger and with the lobes of the corolla reflexed. *Ovary* cylindric, tomentose, crowned by the broad discoid stigma, 1-celled, with 2 pendulous collateral ovules. *Drupe* elliptic, compressed, the apex with a slight apiculus bearing the stigma, the base narrowed; the calyx and corolla persistent but not enlarged, minutely velvetty; *endocarp* bony, 4-angled, smooth inside. *Seed* solitary.

Perak; Wray, King's Collector.

The tetramerous very small flowers, and large velvetty fruit, distinguish this species. The young branches are sub-glabrous on one side and densely pubescent on the other; at the nodes these two lines cross.

2. IODES VELUTINA, King, n. sp. A scandent shrub; young branches slender, terete, shortly rufous-pubescent, especially so on one side. *Leaves* coriaceous, ovate, acute or very shortly acuminate; the base rounded, slightly emarginate; upper surface sparsely and minutely pilose, the midrib tomentose; lower surface densely velvetty-tomentose; main nerves about 4 pairs, ascending, curved; length 2·5 to 3·75 in., breadth 1·35 to 2·25 in., petiole ·35 to ·6 in. *Cymes* axillary, terminal or leaf-opposed, longer than the leaves, pubescent, few-flowered, sometimes bearing tendrils. *Male flowers* ·1 in. long, or slightly more, globose-ovoid in bud, on very short pedicels. *Calyx* cupular, with 5 small acute teeth. *Corolla* little more than twice as long as the calyx, with 5 deep oblong concave teeth with inflexed apices, adpressed-pilose externally and glabrous internally like the calyx. *Stamens* nearly as long as the corolla; the filaments short, pilose, the anthers oblong. *Rudimentary ovary* ellipsoid, pilose. *Drupes* elongated-obovoid, compressed, 4-angled, obtuse or retuse at the apex, the stigma persistent, much narrowed to the base where the corolla and calyx are persistent, minutely cinereous-tomentose, 1·25 in. long, and ·5 in. broad; *endocarp* bony, more or less 8-angled, smooth inside. *Seed* solitary, compressed.

Malacca; Maingay (Kew Distrib.), No. 380, and perhaps No. 1039. Perak; Scortechini, Wray.

The leaves of this resemble those of *I. ovalis*, Bl.; but they are more velvetty beneath. The calyx and fruit are much larger than in that species and the cymes have fewer flowers.

3. IODES OVALIS, Blume Bijdr. 30. A climbing shrub 20 to 60 feet long; young branches slender, rufous-tomentose, striate, with a few axillary or leaf-opposed tendrils. *Leaves* opposite, sub-coriaceous, ovate to rotund, acute or very shortly acuminate, the base rounded sometimes slightly emarginate; upper surface glaberulous, the midrib and nerves rufous-tomentose like the whole of the lower surface; main nerves 4 or 5 pairs, curved, ascending, prominent on the lower surface as are the transverse veins; length 2·5 to 5·5 in., breadth 1·75 to 3·25 in. *Male flowers* in leaf-opposed or terminal, much-branched, lax, rufous-tomentose cymes 6 to 8 in. long. *Flowers* ·15 in. in diam., on pubescent pedicels ·1 to ·2 in. long. *Calyx* discoid, irregularly 3- to 6-toothed rufous-villose. *Corolla* 5 or 6 times as long as the calyx, deeply divided into 5 lanceolate lobes with long acuminate inflexed points, strigose externally, glabrous internally; *stamens* much shorter than the corolla-lobes, the filaments much shorter than the broadly ovate anthers; *rudimentary pistil* erect, cylindric, pilose. *Female flowers* with calyx and corolla like the male; *stamens* 0. *Ovary* cylindric, tomentose, crowned by a large discoid stigma wider than itself, 1-celled, with 2 pendulous ovules. *Drupe* ovoid, compressed, slightly oblique at the base, rufous-tomentose, crowned by the persistent stigma, ·75 in. long, and ·5 in. in diam., *pericarp* thin; *endocarp* bony, rugose outside, smooth inside. Mast. in Hook. fil. Fl. Br. Ind. I, 596; Beccari Malesia, I, 124; Baill. in DC. Prod. XVII, 22; *I. tomentella* cumvar. Br. in Benn. Pl. Jav. Rar. 243, t. 48; Hassk. Cat. Pl. Hort. Bogor. 172; Miq. Fl. Ind. Bat. i. 795. *I. tomentella*, Miq. Fl. Ind. Bat. I, Pt. 1, 796; Kurz For. Flora Burmah I, 243. *Natsatium oppositifolium*, Planch. in Hook. Lond. Journ. Bot. V, 247.

Malacca; Griffith, Maingay. Perak; Scortechini, Curtis, King's Collector; common.—DISTRIB.—Burmah, Sumatra.

4. IODES OBLONGA, Planch. in Hook. fil. Fl. Br. Ind. I, 597. A slender climbing shrub; young branches cinereous-tomentose, ultimately glabrescent and rugose. *Leaves* membranous, oblong or oblong-lanceolate, glabrous above except the pilose midrib and nerves, beneath adpressed-pilose, the midrib pubescent; main nerves 7 or 8 pairs, curving, spreading; length 3 to 4·5 in., breadth 1 to 1·6 in., petiole ·3 or ·4 in. *Cymes of male flowers* axillary or terminal, dichotomously branched, slender, cinereous-pilose. *Male flowers* ·05 in. long. *Calyx* nearly as long as the corolla, with 5 deep lanceolate lobes. *Corolla* rufous-tomentose externally. *Female flowers* and drupes not seen,

Penang; Phillips, Curtis, No. 2438. Singapore; King's Collector, No. 1185.

This species has smaller flowers, with a longer calyx, than the last: its leaves are narrower, and its pubescence is cinereous not rufescent.

20. ERYTHROPALUM, Blume.

Climbing glabrous shrubs with axillary tendrils. *Leaves* alternate, entire, 3- to 5-nerved at the base. *Cymes* slender, pedunculate, dichotomous; the cymules umbellate, minutely bracteolate. *Flowers* bisexual. *Calyx* with 5 broad short teeth, imbricate in æstivation, its tube adherent and much enlarged in fruit. *Corolla* perigynous; *petals* 5, short, broad, spreading, slightly coherent by their bases, inserted outside the large cupular fleshy 5-lobed disc, valvate in æstivation. *Stamens* as many as the petals, opposite to them and slightly attached to their bases, *filaments* short; *anthers* broadly ovate with lateral longitudinal dehiscence, the connective rather large. *Ovary* half immersed in the disc, tapering to a short terminal style, 1-celled; *ovules* 1 to 3, pendulous from the apex; *stigma* minute, 3-lobed. *Fruit* crowned by the persistent calyx-lobes and the disc, oblong, 1-celled; the pericarp and putamen thin, lined by a pulpy coat, splitting, when dry, into 3 to 5 vertical segments. *Seed* solitary, pendulous; the embryo minute, lying near the apex of the large fleshy albumen.

To this genus there are attributed in the Flora of British India three species, *viz.*, *E. scandens*, Bl. *E. populifolium*, and *E. vagum*, Mast. Each of the three originally appeared in Botanical literature as the type of a distinct genus. Of these three genera, *Erythropalum* is the oldest and is therefore now retained. It was founded by Blume (Bijdr. 921) in 1826, and was by him referred to the Natural order *Cucurbitaceæ*. As Blume describes the flowers as monœcious, his material was presumably imperfect. For the reception of the second species, Dr. Walker-Arnott, in Jardine's Magazine of Zool. and Bot. for 1838, p. 551, formed the genus *Mackaya*, and in an excellent note he discusses its affinities. Of it he says, "I cannot indicate the natural order, nor even the place in the linear series which it ought to occupy;" but on the whole he was inclined to regard it as a species of *Olacineæ* near *Schœpfia*, but with perfectly inferior fruit. Walker-Arnott considered it to be also allied to *Santalaceæ*, although differing both from that Order and from *Olacineæ* in the absence of a central columella in its ovary; while, from *Santalaceæ*, it has the additional difference of possessing a corolla. And he suggests the formation of *Mackaya* and *Schœpfia* into a small calycifloral order connected on the one hand with *Santalaceæ* and on the other with *Olacineæ*. The third species *E. vagum* Mast., was first published by Griffith (Notulæ IV, 633 and Ic. Pl. Ind. Or. t. 628) as the type of a genus which, from its supposed affinity with *Modecca*, be named *Modeccopsis*. The relation to *Modecca* is however superficial, and extends only to a similarity in general habit and in the externals of the fruit. For in structure the flowers of *Modecca* are very different from those of *Modeccopsis*, inasmuch as they have no perigynous (finally epigynous) disc, and the superior ovary has 3 parietal multi-ovulate placentas, while the fruit is a 3-valved many-seeded capsule. Planchon [Ann. des Sc. Nat. Ser. IV. Bot., Vol. II, p. 260 (1854,)] suggests the formation of a natural order for the reception of the single species *Erythropalum*, a suggestion followed by Miquel; while Baillon puts it (along with *Olacineæ Santalaceæ*, *Ampelideæ*, *Styraceæ*, and *Loranthеæ* proper) into his order *Loranthacées*. Messrs. Hooker and Bentham put *Erythropalum* into *Olacineæ*, where, in spite of its affinities with the Cornaceous genus *Nyssa*, it may be left for the present, although its inferior fruit makes its inclusion in *Olacineæ* rather an anomaly. To this genus also without doubt belong *Decastrophia*, Griffith (Notulæ IV, 737); *Erythropalla*, Hassk. Cat. Hört. Bogor, 191; and in all probability (as Valenton suggests) the obscure plant named *Balingayum decumbens* by Blanco (Fl. de Filip. 187.)

1. ERYTHROPALUM SCANDENS, Blume Bijdr. 921. *Leaves* membranous, ovate-oblong or elliptic to oblong-lanceolate, acuminate, the base rounded or minutely cordate, sub-peltate; basal nerves 3 to 5, two of them minute; lateral nerves about 4 pairs, distant, faint: length 3 to 6 in., breadth 1·75 to 3·75 in., petiole ·75 to 1·75 in. *Tendrils* (abortive peduncles) simple or bifid, thickened upwards. *Cymes* slender, shorter than the leaves, divaricate, the peduncles long. *Flowers* under ·1 in. in diam. *Fruit* oblong, ellipsoid or slightly obovoid, glabrous, the epicarp yellowish. *Seed* large, ovoid, without testa. Miq. Fl. Ind. Bat. I, Pt, 1, 704; Hook. fil. Fl. Br. Ind. I, 578; Pierre For. Flor. Coch. Chine, t. 269 A; Kurz For. Flora Burma, I, 234; Valeton Olacineæ 132; Wall. Cat. 7539 Menisperma ?; also No. 9033 (without name). *Cocculus calophyllus*, Wall. MSS.

Malacca, Perak:—DISTRIB. Java, Burmah, Tropical Himalaya, Khasia Hills.

Closely allied to, if not identical with, this is *E. vagum*, Mast. And *E. populifolium* Mast. (Wall. Cat. Nos. 1233 BIS. and 2248; *Passiflora Heyneana*, Wall.)

21. PTELEOCARPA, Oliv.

Trees. *Leaves* alternate, simple, penni-nerved, petiolate. *Inflorescence* terminal, panicled, many-flowered. *Flowers* regular, dichlamydeous, hermaphrodite. *Calyx* tubular below, limb deeply 5-parted, lobes imbricate, not accrescent. *Corolla* tubular below-limb deeply 5-parted, lobes imbricate, glabrous. *Stamens* 5, glabrous, attached to the tube of the corolla, alternate with its lobes; *anthers* linear-oblong, innate, dehiscing longitudinally. *Ovary* free, stipitate, 2-celled; *styles* 2, *stigmas* small; *ovules* solitary in each cell, pendulous, anatropal, raphe lateral or subventral. *Fruit* 2-celled, samaroid, orbicular, emarginate; the wings broad, thin, striate. *Seed* elongate, much compressed, albuminous; *radicle* superior, cylindrical; cotyledons linear-lanceolate, longer than the radicle.—DISTRIB. Species 2, both Malayan.

PTELEOCARPA MALACCENSIS, Oliver in Trans. Linn. Soc. XXVIII, 515, t. 42. A tree; young branches terete, glabrous, slender; all parts except the puberulous inflorescence glabrous. *Leaves* membranous, oblanceolate or oblanceolate-oblong, shortly and bluntly acuminate, the base much narrowed; midrib prominent beneath, the 5 or 6 pairs of curving spreading main nerves obscure on both surfaces; length 3 to 4·5 in., breadth 1·25 to 1·5 in., petiole ·6 to ·75 in. *Panicles* terminal, umbellately cymose, spreading, many-flowered, 1·5 to 2·5 in. in diam.; bracts minute, deciduous. *Pedicels* ·15 to ·25 in. long, filiform, ascending, lengthening in fruit. *Flowers* yellow, (or red ?) ·3 in., in diam. *Calyx-lobes* broadly ovate, obtuse, puberulous. *Corolla* four times as long as the calyx, its tube short, the lobes deep, oblong, obtuse. *Stamens* as long as the corolla; the filaments slender, glabrous, the anthers elliptic. *Ovary* on a short thick stalk, oblong, glabrous, compressed, slightly furrowed, obtuse. *Fruit* 1·25 to 1·65 in. long, the calyx persistent at the base not quite so broad. *Seed* ·5 in. long: embryo much shorter than the albumen. Beccari, Malesia, I, 130; Miq. Fl. Ind. Bat. Suppl. 511.

Malacca; Maingay. Penang; Curtis, Nos. 835 and 1494. Perak; Wray, No. 3418. Singapore; Hullett, Nos. 3609 and 3610.

I have seen an authentic specimen of *Dodonæa Lamponga*, Miq. (Fl. Ind. Bat. Suppl. 511) and there can be no doubt that it belongs to this or to a closely allied species. It was collected by Teysmann in Eastern Sumatra. Beccari has described (Malesia, I, 130) a species (*P. longistyla*) from Borneo, which appears to differ from *P. malaccensis* by the length of its styles and the shortness of the filaments of its stamens.

22. CARDIOPTERIS, Wall.

Herbaceous, scandent, glabrous, the juice milky. *Leaves* alternate, long-petiolate, simple, palminerved. *Flowers* small, hermaphrodite regular, in axillary long sparse few-branched panicles. *Calyx* 5-partite, the lobes imbricate, persistent in the fruit, but very slightly accrescent. *Corolla* very deciduous, sub-campanulate, deeply 5-lobed, imbricate. *Stamens* attached to the short tube of the corolla and alternate with its lobes; filaments short, glabrous; anthers 2-celled, introrse, with vertical dehiscence. *Disk* none. *Pistil* free, cylindrical, slightly compressed, 1-celled: crowned by two stigmas, the one stipitate short and capitate, the other elongating after flowering. *Ovules* 2 (1 usually aborted), pendulous from the apex of the ovary. *Fruit* samaroid, obovate, oblong, emarginate at the apex; the nucleus narrow, elongate, prolonged laterally into membranous, horizontally striate wings and crowned by the columnar accrescent stigma. *Seed* solitary, pendulous, linear, sulcate, with thin testa, fleshy granular albumen, and small conical embryo.—DISTRIB. A single Malayan species.

CARDIOPTERIS LOBATA, Wall. Cat. 8033 A, and in Benn. Pl. Jav. Rar. 246, t. 49. *Stems* twining, terete, striate, pale when dry. *Leaves* membranous, ovate-cordate, acuminate, more or less lobed, glabrous; main nerves 7 to 9, radiating from the apex of the petiole; length 2·25 to 5 in., breadth 1·5 to 2·75 in., petiole 2 to 5 in. long. *Panicles* 2 to 4 in. long, solitary, axillary, on long peduncles with a few long slender recurved few-flowered branches. *Flowers* distant, ·1 in. long, on short puberulous pedicels. *Calyx* puberulous; corolla slightly longer than the calyx, pale. *Anthers* emarginate. *Fruit* ·8 to 1·25 in. long, by ·6 to ·8 in. broad, the calyx persistent and very slightly accrescent. *Seed* sub-cylindric, compressed: Miq. Fl. Ind. Bat. I, Pt. 1, 799. H. Brongn. in Adansonia, X, 280: Baillon in DC. Prod. XVII, 26. *C. moluccana*, Blume, Rumphia, IV, 207. t. 177, f. 2. *C. javanica*, Blume l. c. III, 206, IV, t. 177. *Peripterygium quinquelobum*, Hassk. Cat. Pl. Hort. Bogor. 351. *Olus sanguinis*, Rumph. Herb. Amb. V, t. 482.

Perak: King's Collector.—DISTRIB. British India, Siam, Malayan Archipelago, New Guinea.

A widely distributed plant, varying considerably as to the form of its leaves. On these diversities of shape, four varieties have been founded.

The position of *Cardiopteris* has given rise to considerable discussion. Robert Brown was the first to suggest its affinity to *Phytocrene* and *Iodes*. By Wallich (its original founder) the genus was placed in *Sapindaceæ*; Hasskarl placed it in *Euphorbiaceæ*; and Blume regarded it as forming a separate family near *Boragineæ* and *Verbenaceæ*. There is no doubt that the gamopetalous character of the corolla and the absence of a disk are characters at variance with those of the majority of the species which are grouped in the family of *Olacineæ*; but the ovulation and structure of the fruit of *Cardiopteris* are quite unlike those of either of the gamopetalous families suggested as allies by Blume. The single character which, in my opinion, suggests a relationship with *Euphorbiaceæ* is the milky nature of the juice. The stamens and ovary, as Brown pointed out, are essentially those of *Iodes*, from which genus however this differs in calyx and in fruit. The genus with which, as it appears to me, there is by far the closest relationship is *Pteleocarpa*, Oliver. In fact the only characters which separate *Pteleocarpa* from *Cardiopteris* are that *Pteleocarpa* is a tree, while *Cardiopteris* is a scandent milky-juiced herb; and that *Pteleocarpa* has a 2-celled ovary and 2-celled fruit. And even this latter distinction is to a great extent neutralised by the facts that, although there are two cells in the ovary of *Pteleocarpa*, there is only 1 ovule in each; and that both genera have two stigmas which are to some extent persistent in the fruit. The fruits of the two are strikingly alike, both being samaroid; and in this respect differing from all the other Asiatic genera which it has ever been proposed to include in *Olacineæ.* So great are the affinities of the two genera with each other, and so great their divergence from the other genera in the order, that I think they ought either to be separated as a tribe of *Olacineæ* or that the Natural family *Cardiopterideæ* first suggested by Blume, partially approved of by R. Brown, and adopted by Baillon, should be kept up, and that *Pteleocarpa* should be added to it.

ORDER XXX.—ILICINEÆ.

Shrubs or trees. *Leaves* alternate, simple, exstipulate, or with 2 minute stipules, usually coriaceous and evergreen. *Flowers* small, in axillary cymes fascicles or umbellules, usually diœcious; ♂ with imperfect ovary, and ♀ with imperfect stamens. *Calyx* 3–6-partite or -lobed; segments or lobes imbricate, persistent. *Petals* 4–5, rarely 6–8, connate at the base, or connate in the ♂ and free in the ♀, deciduous, imbricate. *Stamens* 4–5, adhering to the bases of the petals, sometimes free and hypogynous in the ♀: *filaments* subulate; *anthers* shortly oblong, dorsifixed. *Disk* 0. *Ovary* free, 3–16-celled; *style* 0, or very short, rarely long, stigma capitate or discoid; *ovules* 1, or 2 collateral, pendulous, raphe dorsal, micropyle superior, funicle often cupular. *Drupe* with 2 or more 1-seeded, free, rarely connate stones. *Seed* with a membranous testa, fleshy albumen and minute embryo.—DISTRIB. Three genera, and about 220 species, chiefly tropical.

1. ILEX, Linn.

Calyx 4–5-lobed or -parted. *Corolla* with petals free or connate at the base and rotate. *Stamens* 4–5, adhering to the base of the corolla in the ♂, sometimes hypogynous in the ♀. *Ovary* 2–12-celled; *styles* 0 or very short, stigmas free or confluent on the top of the ovary. *Drupe* globose, very rarely ovoid, with 2–16 stones.—DISTRIB. Of the Order; species about 220.

Flowers of both sexes in simple axillary racemes ... ... 1. *I. spicata.*
Flowers in axillary fascicles.
  Pyrenes 6 or 7
    Leaves very obtuse, entire ... ... 2. *I. epiphytica.*
  Pyrenes 4
    Leaves acute, serrulate ... ... 3. *I. Griffithii.*

Leaves shortly acuminate, entire ... 4. *I. glomerata.*
Flowers of both sexes in branched pedunculate cymes.
Pyrenes 4 to 6; nerves of leaves 10 to 12 pairs ... ... 5. *I. Maingayi.*
Pyrenes 8
Cymes dense, capituliform; nerves of leaves 7 or 8 pairs ... ... 6. *I. macrophylla.*
Cymes branched, often paniculate, rather lax; nerves of leaves 6 to 8 pairs ... 7. *I. cymosa.*
Imperfectly known ... ... 8. *I. sclerophylla.*

1. ILEX SPICATA, Bl. Bijdr. 1149. A glabrous shrub (sometimes epiphytal, *fide* Blume); young branches rather stout, pale, glabrous. *Leaves* coriaceous, elliptic, shortly and abruptly caudate-acuminate, the base rounded or slightly cuneate; the midrib stout, prominent beneath, depressed above; main nerves 7 to 12 pairs, faint, spreading (not much more prominent than the secondary) straight, interarching within the edge; length 3·5 to 6 in., breadth 1·5 to 2 in., petiole ·2 in. *Racemes* solitary or in pairs, axillary, ·75 to 1·5 in. long, sub-erect or spreading, puberulous, the bracts minute, pedicels 1 in. long. *Flowers* shorter than the pedicels. *Calyx* rather flat, with 4 or 5 broad rounded lobes. *Petals* broadly oblong, united at the base, finally reflexed. *Stamens* as many as the petals, inserted at their edges near the base; *filaments* longer than the corolla, *anthers* small. *Female flowers* like the male, but the petals and stamens smaller. *Ovary* broadly ovoid, compressed, 16-celled; the stigma large, sessile, elongate. *Drupe* ·15 in. long, broadly ovoid, compressed, the stigma persistent; *pyrenes* 10 to 16, compressed. Hook. fil. Fl. Br. Ind. I, 598. *Prinos spicata*, Miq. Fl. Ind. Bat., I, Pt. 2, 594.

Malacca: Maingay (Kew Distrib.), No. 390. Perak: King's Collector, No. 2463.—DISTRIB. Java, (?) Borneo, Sumatra.

A species readily distinguished by its compressed fruit which has moreover many pyrenes (from 10 to 16).

2. *Ilex epiphytica*, King, n. sp. A small glabrous epiphytic shrub; young branches rather stout, pale brown, striate. *Leaves* coriaceous, oval or elliptic, sometimes sub-obovate, very obtuse, the edges entire recurved when dry, the base slightly narrowed; main nerves 5 or 6 pairs, rather straight, spreading, not prominent; length 2 to 2·75 in., breadth 1 to 1·35 in., petiole ·15 in., stout. *Female flowers* in axillary fascicles of 5 to 7, ·15 in. in diam., their pedicels ·15 in. long. *Calyx* with 5 to 7 broadly ovate concave obtuse imbricate teeth, puberulous at the edges. *Petals* 6, oblong, sub-obtuse, longer than the calyx, free, nearly equal, imbricate. Ovary broadly ovoid, tapering to the very short style,

6- or 7-celled; *stigma* discoid, dotted in the middle. *Drupe* ovoid, ·2 to ·25 in. long, crowned by the persistent style and stigma; *pyrenes* 6 or 7, trigonous. *Male flowers* not known.

Perak; at elevations of about 5,000 feet, Wray, No. 3811; King's Collector, No 7413.

3. ILEX GRIFFITHII, Hook. fil. Fl. Br. Ind. I, 601. A bush or small tree; young branches stout, pubescent or glabrescent. *Leaves* coriaceous, elliptic, rarely elliptic-rotund, acute, the edges serrulate, the base slightly narrowed; upper surface glabrous, except the depressed puberulous midrib; lower surface puberulous or glabrescent, the midrib prominent and pubescent; main nerves about 8 pairs, spreading, inter-arching far from the edge; length 1 to 2·5 in., breadth ·5 to 1·3 in., petiole ·15 to ·25 in. *Flowers* 4-merous; the males fascicled, less than ·2 in. in diam., on pedicels longer than themselves. *Female flowers* larger than the males, in smaller fascicles, and sometimes solitary. *Calyx* a shallow cup, with 4 broad shallow ciliolate lobes. *Petals* broadly oblong, obtuse, finally re-curved, connate near the base. *Ovary* globose; *stigma* sessile, 4-lobed. *Drupe* globose or ovoid-globose, glabrous or glabrescent, ·15 in. in diam., the pulp scanty; *pyrenes* 4, coriaceous, rounded at the back; *pedicel* ·35 to ·6 in. long.

Malacca: Griffith, Maingay. Perak: Wray, King's Collector.—DISTRIB.: Sumatra, Java, Khasia Hills and Cachar, Assam.

4. ILEX GLOMERATA, King, n. sp. A glabrous shrub or small tree; young branches, slender, dark-coloured. *Leaves* thinly coriaceous, oblong or elliptic-oblong, acuminate, the edges entire slightly wavy and recurved when dry, the base cuneate; main nerves 6 or 7 pairs, curving, ascending, forking, obsolete on the upper, faint on the lower surface; length 3 to 4·5 in., breadth 1·3 to 1·75 in., petiole ·3 to ·4 in. *Male flowers* ·2 in. in diam., in axillary fascicles of 6 to 12, their pedicels ·15 in. long. *Calyx* minute, with 4 shallow rounded teeth. *Petals* 4, very much longer than the calyx, broadly ovate, membranous, slightly coherent by their bases, hypogynous. *Stamens* alternate with and longer than the petals, slightly adherent to them at the base; *filaments* subulate, much longer than the broad shortly ovoid suturally dehiscent anthers; *Rudimentary ovary* ovoid, compressed, *stigma* sessile. *Female flowers* not known. *Drupes* globular, ·3 or ·35 in. in diam., the pulp copious; *pyrenes* 4, trigonous.

Perak: King's Collector, Curtis, No. 2091, Scortechini.

5. ILEX MAINGAYI, Hook. fil. Fl. Br. Ind. I, 605. A glabrous tree 20 to 30 feet high (60 to 80 *fide* Kunstler); young branches stout, lenticellate, dark-coloured. *Leaves* coriaceous, elliptic, narrowly elliptic-oblong or oblanceolate-oblong, sub-acuminate, the base narrowed; upper

surface shining, the lower dull and sub-glaucous; main nerves 10 or 12 pairs, sub-horizontal, faint on the lower, obsolete on the upper surface; length 4 to 5·5 in., breadth 1·35 to 2 in., petiole ·4 to ·65 in. *Male flowers* in pedicelled sub-umbellulate sub-racemose cymes about 1·25 in. long; the buds globular, less than ·1 in. in diam. *Calyx lobes* 4 in the male, 6 in the female, rounded, not ciliate. *Petals in the male* 4, broadly oblong; *stamens* longer than the petals and attached to their bases. *Female flowers* in short racemes; *petals* and *stamens* 6, hypogynous. *Ripe drupes* ovoid or globular, ·2 to ·25 in. in diam., grooved when dry; *pedicels* stout, as long as the drupes, pulp scanty; *pyrenes* 4 to 6, trigonous, thickly coriaceous; *stigma* sessile, swollen.

Penang, Maingay; (Kew Distrib.), No. 1021; Curtis, No. 2152. Perak; Scortechini, King's Collector.

6. ILEX MACROPHYLLA, Wall. Cat. 4331. A tree 15 to 30 feet high; young branches stout, pale, sometimes lenticellate. *Leaves* coriaceous, elliptic to elliptic-oblong, obtuse or sub-acute, entire, the base slightly narrowed; upper surface shining with the midrib depressed and the nerves obsolete; the lower dull, the 12 pairs of spreading nerves slightly prominent and interarching freely at some distance from the edge; length 4 to 6 in., breadth 2 to 2·5 in., petiole about ·5 in. *Cymes* dense, capituliform, often branching; their pedicels slender, axillary, longer than the petioles. *Flowers* ·15 in. in diam., 4–6-merous. *Calyx* with broad deep teeth. *Petals* broadly oblong, obtuse in the male flowers, united at the base; in the females, free and sub-equal. *Stamens* longer than the corolla and inserted on it. *Drupes* sub-globular, ·2 in. in diam., the *stigma* permanent and prominent; *pyrenes* about 8, trigonous.

Penang: Phillips, Wallich, Curtis, King's Collector. Malacca: Griffith, Maingay. Singapore: Ridley.

7. ILEX CYMOSA, Blume Bijdr. 1149. A glabrous tree 15 to 40 feet high; young branches slender, very pale. *Leaves* thinly coriaceous, elliptic-oblong to elliptic, the apex often shortly and bluntly acuminate, the base slightly narrowed or rounded, lower surface slightly glaucous; main nerves about 6 to 8 pairs, curved, ascending: length 2·5 to 4·5 in., breadth 1·35 to 2·5 in., petiole ·25 to ·35 in. *Cymes* solitary, pedunculate, branched and often paniculate, spreading, many-flowered, rather lax. *Flowers* ·1 in. in diam.; their pedicels slender, ·25 in. long. *Male flowers* 4–5-merous; the calyx lobes broad, rounded, ciliolate; *petals* broadly obtuse, about as long as the stamens. *Female flowers* with 5–6-merous calyx, and 6 to 8 short erect free concave slightly unequal petals; *ovary* globular-pyramidal; *style* short, thick; *stigma* large, hemispheric. *Drupes* globular, ovoid, crowned by the persistent style and stigma,

grooved when dry; the pulp scanty; *pyrenes* about 8, trigonous. Hook. fil. Fl. Br. Ind. I. 605. *I, singaporiana*, Wall. Cat. 6526. *Prinos cymosa, Hassk.* Tijdschr. Nat. Gesch. X, 140: Miq. Fl. Ind. Bat. I, pt. 2, 595. *Leucodermis javanica*, Planch. MSS.

In all the provinces except the Andaman and Nicobar Islands: common.—DISTRIB,—Sumatra, Java, Borneo, and probably in other islands of the Malayan Archipelago.

The short thick style is in the ovary often obscured by the stigma, but in the ripe fruit it is very apparent.

8. ILEX SCLEROPHYLLA, Hook. fil. Fl. Br. Ind. I, 606. *Leaves* thickly coriaceous, elliptic-oblong, obtuse, the edges entire, narrowed at the base into the very thick petiole; upper surface shining, the lower glaucous; length 5 or 6 in., petiole ·5 in. *Female cymes* 1 in. long, sparingly branched, the peduncle very stout, the branches apparently 3-flowered; the pedicels stout, ·25 in. long. *Calyx* with 5 rounded ciliolate lobes. *Petals* minute, free, unequal. *Ovary* ovoid, truncate, *stigma* sessile.

Malacca, on Mount Ophir: Griffith, No. 5013.

I have seen no specimens of this except Griffith's which is at Kew, and the above description is largely copied from Sir Joseph Hooker.

* * *

Description of a New Lathraea *from the Eastern Himalaya.*—*By* SURGEON CAPTAIN H. A. CUMMINS, *Army Medical Staff.*

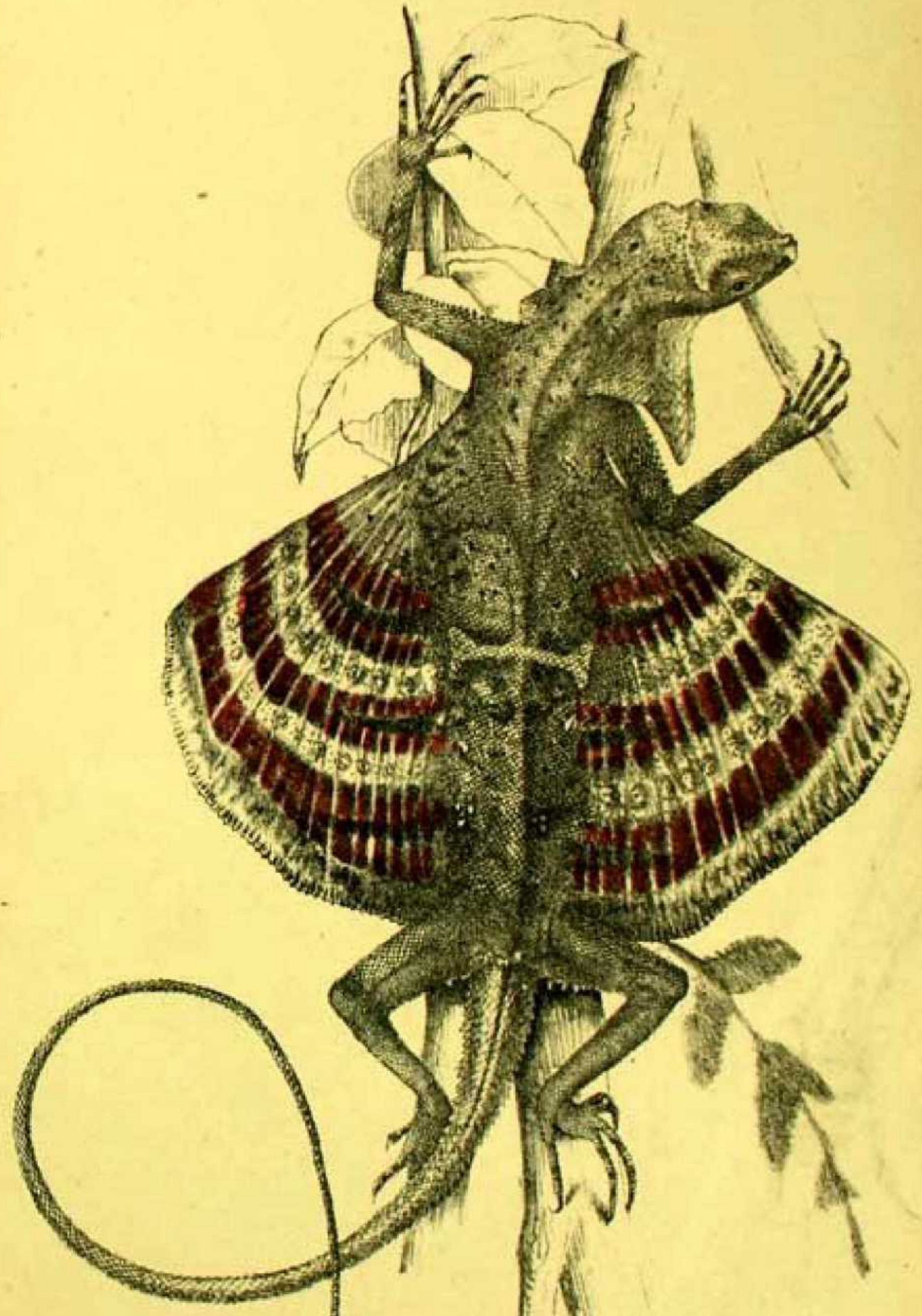
[Read, 6th Feb.]

During an expedition to the Dichu Valley in August, 1893, a species of *Lathraea* was found growing in black soil in dense bamboo jungle. The connection with the roots of the bamboo (*Arundinaria aristata* Gamble) was not made out, but there was no other plant except this bamboo in its neighbourhood. The specimens could not be matched in the Calcutta Herbarium by Dr. King, Dr. Prain, or myself. Dr. Prain and I have since examined the material of *Lathraea* in the Kew Herbarium and have come to the conclusion that the specimens represent a very distinct new species most nearly related to *Lathraea clandestina* Linn. The systematic description of the new species is as follows:

LATHRAEA (§ Clandestina) PURPUREA *Cummins;* diffusa laxius ramosa, caulibus purpureis brevibus (3—4-unc.) gracilibus squamosis; squamis purpureis orbicularibus obtusis oppositis breviter petiolatis; floribus racemosis longiuscule pedicellatis, strictis, erectis; bracteis squamis caulinis conformibus sub-sessilibus; calyce cylindrico-campanulato hirsuto, 10-costato, indistincte 2-labiato, purpureo; corollae tubo pur-

pureo calyce sub-2-plo longiore (0·75 unc.), labio superiore purpureo galeato infra apicem utrinque subacute 1-dentato, inferiore 3-lobo, albo-purpurascente venis purpureis ornato; staminibus didynamis inclusis filamentis anticis prorsus hirsutis quam posticos tertio summo tantum hirsutos distincte brevioribus; ovario 2-lobo purpurascente apice plano-convexo, stylo simplici stigmate minimo, subexserto, loculis 10—15-ovulatis; capsula matura ignota.

In HIMALAYA ORIENTALI: Bhután, in valle Dichu, 12,000 p.s.m.; ipse! Haec evidenter arcte *L. clandestinae* Linn. (*Clandestinae rectiflorae* Lamk.) affinis, statim tamen differt statura minore, habitu laxiore, squamis petiolatis, planta tota fere concolore purpurea, nec caulibus, more *L. clandestinae*, squamisque luteis; calyce subintegro nec distincte 4-fido, corollaque multo minore dentibus galea subapicalibus subacutis nec rotundatis, ovario apice fere plano et ovulis magis numerosis. Simulac *L. purpurea* caulibus brevibus squamis oppositis et floribus racemosis pedicellatis cum *L. clandestina* arcte convenit et cum hac specie sectionem *Clandestinam* satis bene limitatam indicat, a sectione *Eulathraea*, *L. squamariam*, *L. Rhodopeam* et *L. japonicam* includente et caulibus elongatis, squamis alternis, floribusque subsessilibus spicatis gaudente, facillime distincta. Sectio *Clandestina* tamen vix, uti dicant nonnulli, pro genere distincto habenda est: imprimis *L. japonica* habitum *L. squamariae* et *L. rhodopeae* cum floribus fere iis *L. clandestinae*, etsi multo minoribus, congruentibus, ostendit; iterumque *L. purpurea* ovulis quam in *L. clandestina* magis numerosis characteribus floralibus paullo ad *L. squamariam* accedit.



A.C.Chowdhary del & lith.

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Notes on the bleaching action of light on colouring matters.—*By* ALEXANDER PEDLER, F.R.S., &c.

[Read, 6th Feb.]

That many colours fade when exposed to sunlight is a fact which is only too frequently observed, and which admits of no doubt. The colours which are thus bleached are almost invariably of organic nature, while coloured substances of inorganic character are, as a rule, practically unaffected by the action of light. The exact cause of this bleaching action of sunlight on organic colouring matter is, however, not well understood, and the experiments summarized in this note were conducted to add to the sum of our knowledge on this subject. They are, therefore, published not with the hope that they will set the question of the cause of the bleaching action of light at rest, but rather because they strengthen the conclusions which appear to have been arrived at by previous workers on this subject, and to exist in a more or less indefinite form in chemical literature.

That the subject of the bleaching of colours by light is not yet in a satisfactory condition may be judged by the following quotation from a work published as recently as 1890, by Professor E. Hjelt of Helsingfors, the well known Sweedish chemist, who in his work on "General Organic Chemistry," in the chapter on the "Chemical Action of Light," writes*:—

"A considerable number of organic colouring matters lose their colours and become bleached by the action of sunlight; the process by which the colours are destroyed is unknown. The action of light upon sensitive organic substances has been little investigated generally, but a number of single observations of an interesting nature have been lately made on this subject," etc. Hence it would appear there is still room for further experimentation on this subject.

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* General Organic Chemistry, by Hjelt. Translated by Dr. Tinglo, 1890.

The bleaching effect of sunlight or diffused light on colours or coloured fabrics, may be due to several causes. These causes may, perhaps, be summarized as follows :—

1. The bleaching may be due to a decomposing action of the light itself, unaided by any chemical action of the oxygen, carbon dioxide, moisture, ozone, etc., present in the air, or even, though not at all probable in the great majority of cases, the loss of colour may be due to the colouring matter itself being volatile.

2. The bleaching may be caused by the light inducing some chemical action due to the oxygen, carbon dioxide, moisture, ozone, etc., of the air.

3. Or in the case of dyed colours, the bleaching may be due to some action between the organic matters of the fabrics, and the colouring matters under the influence of light, or to a similar action accompanied by a chemical action due to the oxygen, carbon dioxide, moisture, etc., contained in the air.

4. Also the bleaching action may be due to changes connected with the growth of certain low forms of life, such as germinate when bodies in a favourable condition are freely exposed to ordinary air, in which such germs of life practically always exist.

To test these propositions early in 1891, the following sets of experiments were started.

A series of six colouring matters representing roughly different parts of a spectrum was taken. The colours were Purple as represented by neutral Litmus, Blue by Methyl Blue, Green by Methyl Green, Orange by Methyl Orange, Pink by Eosine, and Red by Rosaniline Acetate. Solutions of these substances were taken of definite strength (4 grams in a litre of water), so that they could be always reproduced when required. With these solutions specimens of pure cotton-wool as representing organic matter such as used in various dyed fabrics, and asbestus, representing an inorganic surface, which would have no practical chemical action on colouring matters, were dyed, and afterwards carefully dried. With these three sets of materials, *i.e.*, the solutions, the dyed cotton, and the dyed asbestus, the following principal sets of experiments were made :—

A. The solutions were placed in tubes stoppered merely with cotton-wool, and were then exposed freely to the action of the air and of any germs floating in the air at the time of preparation, and they were placed (*a*) one set in direct sunlight, (*b*) one in diffused daylight opposite a window with a north aspect, and (*c*) one set in perfect darkness. Fifteen experiments of this kind were started.

B. A set of solutions was taken as in A, except that the tubes containing the solution were thoroughly boiled for from 15 to 20 minutes in order to kill any germs likely to produce any action. While the solutions were still boiling the tubes containing them were plugged well with cotton-wool. Sets of these tubes were also exposed in parallel series (*a*) in direct sunlight, (*b*) in diffused daylight, and (*c*) in darkness. Eighteen experiments of this class were started.

C. Sets of the solutions were placed in tubes drawn out at one end and connected with the Sprengel mercurial pump. The solutions were boiled for 15 to 20 minutes, so as to free them from all dissolved oxygen and from all living germs, etc., and they were then completely exhausted of air and hermetically sealed. Sets of the solutions in these tubes were exposed (*a*) in full direct sunlight, (*b*) in diffused daylight opposite a north window, and (*c*) in total darkness. Eighteen experiments of this class also were started.

D. Specimens of cotton-wool, dyed with solutions of the six colours and then thoroughly dried at 100° C, were placed in test tubes, plugged at their mouths with cotton-wool, and then while thus freely exposed to air in its ordinary hygrometric condition, they were placed (*a*) in direct sunlight, and (*b*) in total darkness. Twelve experiments of this class were started.

E. Sets of dyed cotton-wool dried at 100° C, were placed in tubes rendered vacuous by the Sprengel pump, and then hermetically sealed and exposed (*a*) to direct sunlight, and (*b*) in total darkness. Twelve experiments of this class were started.

F. Specimens of asbestus were freed from organic matter and from any organisms, etc., by ignition, and dyed with the colours and carefully dried at 100° C. Specimens were placed in test tubes freely exposed to the air in its ordinary hygrometric state, and plugged with cotton-wool only. These were placed one set (*a*) in full direct sunlight, and (*b*) in total darkness. Ten experiments of this class were started.

G. Similar sets of asbestus specimens dyed with the colours and dried, were placed in tubes carefully exhausted by the Sprengel pump and hermetically sealed. One set was placed (*a*) in full direct sunlight, and a second set (*b*) in total darkness. Twelve experiments of this class were started.

The above sets of experiments were allowed to continue for periods varying in some cases up to nearly three years. In addition also some sets of experiments were tried in which coloured substances were exposed to the action of sunlight after being moistened with water, and the bleaching under these circumstances compared with that produced by sunlight when the coloured bodies were kept free from water and only exposed to moist air. In all cases the presence of evaporating water rendered the bleaching *much* more rapid.

It will be seen that in the above list, A to G inclusive, no less than 97 experiments were started, and in addition to these a good many others were made, which are not reproduced in detail. Each experiment was examined every few days at first, and later on every few weeks, and the condition of the specimens was compared with freshly prepared specimens when necessary, and the results carefully recorded. Hence a large mass of facts was obtained. It will be seen that it would be impossible to describe the detailed results of each individual experiment, as this would take a large amount of space, nor indeed are the results of sufficient value to make the publication of the details necessary. Hence the main results only of the experiments are summarised in seven tables, A to G, which are printed below.

It may be convenient here to explain that the comparative results shown in tables A and B, are intended to differentiate between the causes referred to in 4 previously. The comparison of the results in B and C, is intended to differentiate between the causes referred to in 1 and 2. The comparison of the results given in D and E, and given in F and G, is again intended to differentiate between the causes referred to in 1 and 2, and finally the results of D and E together, compared with those of F and G together, will enable a conclusion to be obtained with reference to cause 3.

A. *All colours in solution in water, placed in test tubes without boiling, and simply closed with a plug of cotton-wool.*

Colour used.	IN TOTAL DARKNESS.			IN DIFFUSED DAYLIGHT, OPPOSITE A NORTH WINDOW.			EXPOSED DAILY TO DIRECT SUNLIGHT.		
	2 months after.	10 months after.	14 months after.	2 months after.	10 months after.	14 months after.	2 months after.	10 months after.	14 months after.
Litmus ...	Unbleached.	Unbleached.	Unbleached.	Unbleached.	Unbleached slightly more purple.	Unbleached slightly more purple.	Began to bleach after few days, in 2 months quite bleached.	Bleached.	Bleached.
Methyl Blue ...	Unbleached.	Unbleached.	Unbleached.	Unbleached.	Unbleached.	Unbleached.	Unbleached.	Unbleached.	Partially bleached.
Methyl Green ...	"	"	"	"	"	"	Partially bleached.	No green colour left, solution blackish.	No green colour left.
Methyl Orange ...	"	"	"	"	"	"	Unbleached.	Result in-conclusive.	Experiment lost.
Eosine ...	"	"	"	"	"	"	Partially bleached.	Considera-bly bleached.	Almost colourless.

B. *All colours in solution in water; solutions boiled for 15 minutes and while boiling the tube closed with a cotton-wool plug. Therefore the liquids had been to a great extent freed from germs, etc.*

	IN TOTAL DARKNESS.			IN DIFFUSED DAYLIGHT OPPOSITE A NORTH WINDOW.			EXPOSED DAILY TO DIRECT SUNLIGHT.		
Colour.	2 months after.	10 months after.	14 months after.	2 months after.	10 months after.	14 months after.	2 months after.	10 months after.	14 months after.
Litmus ...	Unbleached.	Unbleached.	Unbleached.	Unbleached	Unbleached colour slightly purplish.	Unbleached colour slightly purplish.	Began to bleach after few days, after 2 months quite bleached.	Bleached.	Bleached.
Methyl Blue ...	"	"	"	Unbleached.	Unbleached.	Unbleached	Unbleached.	Colour still strong.	Colour still strong.
Methyl Green ...	Solution almost colourless with black deposit. Sol. in HCl. giving green colour.	"	"	Unbleached.	Unbleached.	Unbleached.	Changed to a deep bluish black muddy fluid.	"	"
Methyl Orange ...	Unbleached.	Unbleached.	Unbleached.	Unbleached.	Unbleached.	Unbleached.	Unbleached.	Dried up.	
Eosine ...	Unbleached.	Unbleached.	Unbleached.	Unbleached.	Unbleached.	Still strong coloured.	Decided bleaching.	Decided bleaching but not complete.	Very small amount of colour left.

C. *All colours in solution in water, placed in tubes drawn out and connected with Sprengel Pump, solutions then boiled for 15 minutes, after which the tubes were completely exhausted while liquids were hot, and then hermetically closed.*

Colour.	IN TOTAL DARKNESS.			IN DIFFUSED DAYLIGHT OPPOSITE A NORTH WINDOW.				EXPOSED DAILY TO DIRECT SUNLIGHT.			
	2 months after.	10 months after.	14 months after.	2 months after.	10 months after.	14 months after.	35 months after.	2 months after.	10 months after.	14 months after.	35 months after.
Litmus	Unbleached	Unbleached	Unbleached	Unbleached	Very slightly bleached	Very slightly bleached	Practically unbleached	Apparently slight diminution in colour.	Slightly bleached	Only partially bleached	Only partially bleached
Methyl Blue ...	"	"	"	"	Unbleached	Unbleached	Unbleached	Unbleached	Unbleached	Unbleached	Unbleached
" Green ...	"	"	"	"	"	"	"	"	"	"	"
" Orange ...	"	"	"	"	"	"	"	"	"	"	"
Eosine	"	"	"	No practical bleaching action.	No practical change.	No practical change.	No practical change.	No practical bleaching action.	No practical change.	No practical change.	No practical change.
Rosaniline Acetate ...	"	"	"	Unbleached	Unbleached	Unbleached	Unbleached	Unbleached	Unbleached	Unbleached	Unbleached

D. *Cotton-wool dyed with strong solutions of colours, and dried carefully, placed in test tubes plugged with cotton-wool, exposed therefore freely to air in ordinary hygrometric conditions.*

Colour.	IN TOTAL DARKNESS.			EXPOSED DAILY TO DIRECT SUNLIGHT.		
	2 months after.	10 months after.	14 months after.	2 months after.	10 months after.	14 months after.
Litmus	Unbleached.	Unbleached.	Unbleached.	Largely bleached.	Entirely bleached.	Entirely bleached.
Methyl Blue	"	"	"	Bleached considerably.	"	"
" Green	"	"	"	Largely bleached.	"	"
" Orange	"	"	"	"	"	"
Eosine	"	"	"	Almost entirely bleached.	"	"
Rosaniline Acetate	"	"	"	Commencing to bleach.	"	"

E. *Cotton-wool dyed with strong solutions of colours, then dried thoroughly and placed in tubes which were rendered vacuous by Sprengel Pump, and the tubes then hermetically sealed.*

	IN TOTAL DARKNESS.				EXPOSED DAILY TO DIRECT SUNLIGHT.			
Colour.	2 months after.	10 months after.	14 months after.	35 months after.	2 months after.	10 months after.	14 months after.	35 months after.
Litmus	Unbleached.	Unbleached.	Unbleached.	Unbleached.	Still strongly coloured.	Still rather strongly coloured, but less so than when started.	Considerably bleached but still has light blue colour.	Considerably bleached but still has faint colour.
Methyl Blue ...	„	„	„	„	Apparently slight tendency to bleaching in parts.	Slight tendency to bleaching, colour not so brilliant.	Slight tendency to bleaching.	Still strongly coloured.
„ Green ...	„	„	„	„	Considerably bleached.	Considerably bleached.	Practically entirely bleached.	Practically bleached.
„ Orange ...	„	„	„	„	„	Distinctly bleached.	Entirely bleached.	Bleached.
Eosine	„	„	„	„	Very decided bleaching.	Almost entirely bleached.	Practically entirely bleached.	Bleached.
Rosaniline Acetate ...	„	„	„	„	Unbleached.	Unbleached.	Unbleached.	Unchanged.

F. *Asbestus ignited for an hour to a full red heat and then cooled and dyed with strong solutions of various colours and dried. Samples placed in test tubes, the mouths of which were simply plugged with cotton-wool.*

Colours.	IN TOTAL DARKNESS.				EXPOSED DAILY TO DIRECT SUNLIGHT.			
	2 months after.	10 months after.	14 months after.	35 months after.	2 months after.	10 months after.	14 months after.	35 months after.
Litmus	Unbleached.	Unbleached.	Unbleached.	Unbleached.	Considerably bleached.	Entirely bleached.	Entirely bleached.	
Methyl Blue ...	"	"	"	"	Almost unchanged.	Almost unchanged.	Almost unchanged.	Very little changed.
" Green ...	"	"	"	"	Partially entirely bleached.	Entirely bleached.	Entirely bleached.	
" Orange ...	This colour does not dye Asbestus at all well. Hence no experiments were made.							
Eosine	Unbleached.	Unbleached.	Unbleached.	Unbleached	Almost bleached.	Practically bleached.	Entirely bleached.	
Rosaniline Acetate ...	"	"	"	"	"	"	Bleached.	Bleached.

G. *Asbestus ignited for an hour to a full red heat and then cooled and dyed with strong solutions of various colours and dried. Samples placed in tubes, exhausted by Sprengel Pump and then sealed hermetically.*

Colours.	IN TOTAL DARKNESS.				EXPOSED DAILY TO DIRECT SUNLIGHT.			
	2 months after.	10 months after.	14 months after.	35 months after.	2 months after.	10 months after.	14 months after.	35 months after.
Litmus...	Un-bleached	Un-bleached	Un-bleached	Un-bleached	Un-bleached	Un-bleached	Un-bleached	Un-bleached
Methyl Blue	"	"	"	"	"	"	"	"
" Green	"	"	"	"	Small amount of bleaching	Slight amount of bleaching	Slight bleaching action	Still strongly coloured
" Orange	This colour does not dye Asbestus. Experiments therefore not tried.							
Eosine	Un-bleached	Un-bleached	Un-bleached	Un-bleached	Un-bleached	Un-bleached	Un-bleached	Un-bleached
Rosaniline Acetate... ...	"	"	"	"	Colour not quite so brilliant but no bleaching.	Colour not quite so brilliant but not bleached.	Colour not quite so brilliant.	Still very strongly coloured.

The general results shown in the foregoing seven tables may be fairly accurately summarized in the following small table.

General results of experiments on the bleaching action of Sunlight on Colours.

	In Darkness.	In Diffused Daylight.	In Sunlight.
Solution of colours exposed to air. Solution unboiled...	Unbleached	Unbleached	All bleached
,, ,, ,, ,, boiled ...	,,	,,	Partial bleaching.
,, in vacuô ,, ...	,,	,,	Unbleached
Colours on cotton-wool *in air*, in ordinary hygrometric state	,,	,,	Bleached
,, ,, in vacuô	,,	,,	Partial bleaching.
,, on asbestus *in air*, in ordinary hygrometric state	,,	,,	Bleached
,, ,, in vacuô	,,	,,	Unbleached

The following general conclusions appear to follow from the above experiments taken in conjunction with a number of others which cannot be described in detail :—

1. Organic colours, both in solution in water or on dyed fabrics inorganic or organic, exposed freely to the action of air in the presence of the usual atmospheric conditions of moisture, etc., are practically unacted on in darkness even when exposed to these conditions for nearly three years.

2. Organic colours in the conditions mentioned in 1, are also practically unaffected by diffused daylight opposite a north window, even for the same period of nearly three years.

3. Organic colours in the conditions mentioned in 1, when exposed to the direct rays of the sun are all bleached, but with varying rapidity.

4. In the absence of air (moisture, etc.) strong sunlight, even for a period of three years, has practically no bleaching action on organic colours either in solution in water or used as dyes on inorganic fabrics. In the case of organic fabrics partial bleaching occurs.

5. It hence follows from 4 that the bleaching is not due to any action of light alone or to any volatility of the colouring matters.

6. The bleaching of colours takes place less rapidly when the colours are in solution than when they are dyed on fabrics.

7. The bleaching of colours in solution takes place less rapidly if the living germs or organisms in the solutions are destroyed by boiling than if they be not so destroyed.

8. The bleaching action of light appears to be more powerful if the colours are in contact with an organic fabric than if they are used to colour inorganic materials (asbestus).

9. The bleaching action of light in presence of air is much facilitated by the presence of moisture in contact with the colours and more particularly of *evaporating* water in contact with dyed fabrics.

10. There can therefore be little doubt that the bleaching action of light on ordinary organic colouring matters is usually due to oxidation. This oxidation when facilitated by evaporating water is probably or almost certainly due to the action of ozone, for Gorup von Besanez has shown that ozone is invariably formed when water evaporates in the air.* It therefore appears highly probable also that the action of the sunlight on the oxygen of the air *brings it into an active condition* (resembling perhaps that of ozone), and that the bleaching of organic colours is due to oxidation from this cause; for ordinary oxygen uninfluenced by sunlight does not bleach.

No. 3. *Notes on, and drawings of, the animals of various Indian Land Mollusca (Pulmonifera).—By* LIEUT.-COLONEL H. H. GODWIN-AUSTEN, F.R.S., F.Z.S., &c.

[Read 3rd April.]

Plate VII.

Continued from J. A. S. B., Pt. ii., Vol. LI, 1882, *p.* 71.

After the long lapse of 12 years since publishing my second paper (in 1882), on the drawings of Indian Land-Mollusca made by native artists under the superintendence of Ferdinand Stoliczka, I now forward a third, with the hope that it will lead some of our younger naturalists to make notes and drawings, and if possible dissections, of Indian species, so that they may be more accurately placed in generic position.

The first I have to notice and reproduce on Plate vii, fig. 1, is No. 29 of Ferd. Stoliczka's drawings, a very careful and accurate one of *Helix octhoplax,* with his MS. note attached,—"Asalu; sent down by Major Godwin-Austen." In 1869 I was surveying in the Naga Hills and was able to send a large number of species alive to Calcutta, by packing them in hollow green bamboos. In this way they travel well. No wet moss is necessary, and should be excluded. Green leaves or grass are best, and with the present rapid transit they might in the autumn months reach England in safety. A collection made in Aden reached me all in a living state, and survived a long time, and bred, being viviparous.

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* Ann. Chem. Pharm. clxi. 232; also Roscoe and Schorlemmer Treatise on Chemistry Vol. I., p. 200.

Sub-family *Helicea.*

Sub-Genus EUCOCHLIAS, Theobald.

Catalogue Land and Freshwater Shells of British India, August 1876, p. 26. No description is given, so I add one below.

Type of genus Helix octhoplax, Benson. Plate VII. fig. 1.

Annals and Mag. Nat. Hist., Sept. 1860. from Pegu, (Theobald).

Description of Genus.

Animal.—A true *Helix*; jaw grooved (according to W. T. Blanford, *vide* Nevill's Hand List, p. 81); foot very flat and oval when fully extended; tentacles rather thick, surface granulate, no defined pallial line.

Shell.—Large, solid, closely umbilicated, depressed, convex above and below, keeled, aperture broadly lunate, peristome slightly expanded, reflected near the short solid columella, margins joined by a slight callus. Ranges from the North Khasi Hills eastward. Theobald gives Moyang Khasi Hills as the habitat, and as the type shell described by Benson came from him, Pegu, I think, must be a mistake.

Description of *H. octhoplax* from Moyang, northern side of the Khasi Hills, in my note book: "of a rich dark madder brown colour, base of foot and its narrow edge of same colour but lighter, when partially withdrawn into shell the foot is much flattened and crinkled up along the margin, foot rounded at extremity with no gland above." In the drawing of the animal there is a well marked pale line on the dorsal side of the neck, formed by three strong parallel rugæ or lines, broken up into large tubercles.

This is a very distinct genus, and the animal of very striking and beautiful appearance, if we can apply such a term of praise to a snail, and it is unlike any other *Helix* I have seen in this part of India. It is very rare and local on the North-East Frontier, and I never obtained it on the south of the water-parting. I have it from the north of the Garo Hills, Moyang in the Khasi Hills, and Asalu in the Naga Hills.

Nevill suggests in his Hand List, that it "is probably closely allied to *Stylodon* (*Stylodonta?*) possibly not separable." This can only be settled after a comparative examination of the anatomy of the animals. It would certainly be a very interesting fact with regard to distribution, to find a genus of the Seychelle Islands extending to Eastern India. I hope before long to receive specimens in spirit from the Khasi Hills. *E. illustris* Pfr. from Cambodia is very close to *E. octhoplax*, and Nevill includes *bougainvillei*, Pfr. from the Solomon Islands. Benson taking shell characters alone into consideration and, no doubt, thinking it one of the *Zonitidæ*, placed it near *cycloplax* of Sikkim.

It grows to a large size. My finest specimen measures, major diam. 61·0, minor diam. 51·0, alt. axis 25·0 millim.

Benson's type measures, major diam. 46, minor diam. 26, alt. axis 25·0 millim.

Since commencing this paper I have received another and distinct species of this genus, from my old friend and former assistant in the Indian Survey Department, Colonel Woodthorpe, C.B., who got it on the eastern frontier of Burmah, beyond Fort Stedman; and I am about to describe it in the Annals and Magazine of Natural History. It is preserved in spirit, so that I have been enabled to examine its anatomy. It appears to me far nearer to such forms of *Cochlostyla* as *C. cineracea*, Semper; and if I should be correct in this view, it would be an interesting extension westward of that group of shells.

Genus Plectopylis, Benson, Type *achatina*, Gray.

Annals and Mag. Nat. Hist., April 1860.*

This genus has been treated of by Mr. W. T. Blanford, in Annals and Mag. Nat. Hist., April 1861, and J. A. S. B., Vol. XXXIV, 1865, p. 73. In the P. Z. S., November 1874 and January 1875, and in this Journal for 1879, a number of species both old and new were described and figured with some detail by myself, especially as regards the very peculiar and characteristic internal plication.

This genus is anatomically described most admirably by F. Stoliczka from the type species, in this Journal for 1871, p. 217. How far it differs from *Corilla* of Ceylon, to which it must be closely allied, has still to be made out; as also the true affinity with *retifera* from the Nilgherries, and with *clathratula* from Ceylon, which is still more remote.

Stoliczka, from his observation and knowledge of the animal, considered this genus related to *Clausilia*. The genus is ovo-viviparous as observed in three species—*achatina*, *cyclaspis* and *pinacis*—jaw grooved.

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* Fig. 56 of Stoliczka's Drawings, Moulmain, Pl. vii. fig. 5.

Helix (Plectopylis) minor, Godwin-Austen. Plate VII. figs. 3 and 3a. (No. 51 of MS. Stol.).

Described in Annals and Mag. Nat. Hist., August 1879. Darjiling?

I give below a copy of the original description and add the dimensions then omitted. I now also give magnified drawings of the hair-like epidermal fringe in this species (fig. 3a) and in another allied to it, also from Darjiling, *P. pinacis* (fig. 2a), in which it is seen how greatly they differ, being regular and symmetrical in size and diameter and perfectly rounded at the end in *P. minor*; while in the other it is irregular flattened and divided near the extremity into two or more points, which are again split at the end. This distinction held good in both young and old specimens and was not the result of age or weathering.

It may be interesting here to refer to Plate I, J. A. S., B., 1879, where the epidermal fringe of *P. brachydiscus* is given, shewing another and very distinct form of hairy fringe.

Description. "Shell sinistral, openly umbilicated, discoidal, hirsute. Sculpture coarse with irregular transverse ribbing, near the apex fine and regular ribbing; color pale umber, with regularly disposed broadish transverse bars of sienna-brown: spire flat, only the first three whorls slightly rising above the others; suture shallow. Whorls five, subangular on the periphery of the last, which has four distinct rows of short hairs, entire at the point. Aperture oblique, slightly descending; peristome lunate, slightly flattened on the upper outer margin, but very little reflected, the inner margins connected with a distinct bridge on the parietal side. The parietal vertical lamina is simple, with no distinct horizontal plica below it, as in *macromphalus*; the palatal plicæ are six in front, four behind, the basal one in front thin, and longer than the others."

Major diam. 0·20 in., minor diam. 0·17 in. alt. axis 0·09 inch.
" " 5·0 mm. " " 4·5 mm. " " 2·3 mm.

The animal in Stoliczka's drawing now before me is coloured dark brown, and being a young shell is enlarged. In my MS. notes I find a specimen of *P. macromphalus* from Shillong in the Khasi Hills thus described: "Animal with lower tentacles represented by two small hemispherical protuberances, body all pale with tinge of orange on head and neck: extremity of foot pointed." I must now correct an error in my paper in the Annals and Magazine of Natural History for 1879, where I say that in Stoliczka's drawing it is represented of a pink color.

The animal of *P. plectostoma*, Bs., from Teria Ghat, is thus described in my field book:—"Animal: foot short, of a pale brown yellow tint, neck and tentacles the same slightly darker; tentacles short, the oral very small; no gland on foot, which is pointed."

Helix (Plectopylis) achatina. Gray. Plate VII. fig. 5.

Moulmain? (fig. 56 of MS. Stol.)

Description from drawing.—Animal with long slender eye-tentacles, the oral of ordinary size; colour of tentacles and neck dark umber brown, pale towards the extremity of the foot, which is pointed, very minutely speckled with brown throughout: a broad pale pedal margin, or fringe, distinctly defined by a line of oblong tubercles apparently similar to what is seen in the *Zonitidæ*, but there is no mucous gland at the extremity of the foot.

Helix huttoni, Pfr.

(Fig. 23 of the drawings: no remarks.)

No locality is given; but as the drawing was made on a piece of cardboard on which were two other shells from Darjiling, I imagine it was collected there. I note also that Mr. G. Nevill in his Hand List, gives 30 specimens in the Indian Museum from Darjiling, and in Mr. W. T. Blandford's collection are specimens from the same locality.

In the drawing the animal is shewn nearly pure white including the tentacles, with a pointed extremity to the foot, the pedal margin distinct.

Now true *Helix huttoni*, which was described from the N. W. Himalaya, is very differently described in my Notes on specimens from Waverley, Mussoorie Hill Station:—"Animal light brown, tentacles long and dark brown;" it is doubtful therefore, whether the N. W. Himalayan and the Darjiling species are identical. The former also have a much more hairy, rougher epidermis than those so called *huttoni* from the latter place and the Khasi Hills.

Mr. Theobald placed this species in the genus *Fruticicola* Helder (=*Hygroucia*, Risso, *apud* Adam's genera) of which the European *H. hispida* is the type, and to which in shell structure it closely assimilates. It is just as well in our present state of ignorance of the animal to leave *H. huttoni* in the sub-genus *Fruticicola*, of which the animal is known, rather than in *Plectotropis* of Albers founded on the shell only (of *elegantissima*) from the Liew-Kiew Islands, or in *Planispira*, Beck (type *zonaria*) from Celebes(=*Eurystoma*, Albers, type *vittata*) from Ceylon. We should also be guided somewhat by the known, or rather reputed distribution of *Fruticicola*; which ranges from the European region into Asia and is represented by *rufispira*, Von Martens, in Turkestan; by *plecto-*

tropis and *phæozona*, V. Martens, Sásak Taka; *dschulfensis* in Persia; and by *bactriana*, Hutton, from Kandahar; which carries it close into the Himalayan range. Nevill also describes one (*mataianensis*) from Mataian, Sind Valley, Kashmir.

Helix similaris and *bolus* which have been placed in the genus *Fruticicola* have, I should say, but very slight connection with it. The list of species in *Planispira* and *Plectotropis*, as given by Geoffrey Nevill in the Hand List, will require very considerable revision. In an unpublished copy of his Hand List, greatly corrected, which he was good enough to give me before his early death, he has put *H. huttoni* in *Aegista*, a genus of Albers, who placed in it *Helix oldhami* from Burma, a very different form as regards the aperture of the shell.

Until we know the anatomy of *Eurystoma vittata*, *Plectotropis elegantissima* and *Aegista oculus* from China, it is unsatisfactory work trying to place these Indian species under any of these three genera; and it is very difficult to get hold of the type species in spirit.

Sub-genus Planispira, Beck.

(Type *Zonaria*, Müller from Celebes.)

Eurystoma, Albers (on shell alone), type *H. vittata*, Ferussac, from Madras.

Semi-cornu, Klein.

H. (? *Planispira*) *propinqua*, Pfr. Plate VII, fig. 4.

Central India (fig. 40 of MSS. Stol.)

The remarks which I have made regarding the location of Indian species in this genus, applies here to this one. An examination lately made of the anatomy of some Southern Indian Shells (and I am expecting some more material) shews that a number of them are very closely related, although they do not shew it in shell character.

Description of Plate.

Fig. 1. Animal of Helix (Eucochlias) octhoplax, Benson.
2. Animal of Helix (Plectopylis) pinacis, Benson.
2*a*. Epidermal hairs on keel magnified.
3. Animal of Helix (Plectopylis) minor, G.-A.
3*a*. Epidermal hairs of same magnified.
4. Animal of Helix (Planispira?) propinqua. Pfr.
5. Animal of Helix (Plectopylis) achatina. Gray.

Materials for a Carcinological Fauna of India. No. 1. *The Brachyura Oxyrhyncha.* — *By* A. Alcock, M.B., C.M.Z.S., *Superintendent of the Indian Museum.*

Plates III–V.

[Received 11th April: — Read 1st May.]

It was the intention of my immediate predecessor and late friend James Wood-Mason to write a Descriptive Catalogue of the collection of Crustacea in the Indian Museum.

To this end he had collected a very comprehensive Crustacean literature, and had set in motion a scheme for extracting in a handy form the references contained therein.

He had also roughly sorted the whole collection into its component great-groups, and had made a large number of identifications.

In short he had, before his sad and premature death, collected the raw material for, and sketched the broad foundations of, a work that, had he lived on in unimpaired health, might have been a fit companion and sequel to the classical volumes of that great naturalist Henri Milne-Edwards.

Only in the case of the *Stomapoda* had he gone further than this; and I am now preparing to edit, from the rough MS. notes at my disposal, his account of a part of this Order as represented in the collection of the Indian Museum.

The present paper is the first of a series in which I hope to be able to turn to some — though inadequate — account the mass of material accumulated by my predecessor.

My own work in this paper has been to complete, to arrange systematically, to collate, and to verify the available references to the literature of the Oxyrhyncha; to determine about 70 per cent. of the Indian species contained in the collection of the Indian Museum; to prepare the generic diagnoses and the descriptions of all the species mentioned; and to work out, to the best of my ability, keys — which I hope may be of use to naturalists in India — to sub-families, genera, and species.

In the arrangement of the group as a whole, I have been guided and assisted by the *Revision of the Maioid Crustacea*, by Mr. E. J. Miers, in the Journal of the Linnæan Society (Zoology), Vol. XIV. 1879; and by the same author's *Report on the 'Challenger' Brachyura*; and to these important works I have here to acknowledge my great indebtedness.

I have not, however, been able to give my complete adherence to the classification proposed by Mr. Miers, further than to accept the previously adopted division of the Oxyrhyncha into two groups of equal value—the Maioids and the Parthenopoids. To these groups, I would, following Dr. Claus, give the rank of families—*Maiidæ* and *Parthenopidæ*.

But to further sub-divide a group like the Maioids—in which we find, as Miers himself remarks, every reasonable gradation of form from *Stenorhynchus* to *Pericera*—into separate families, as is done by Miers, involves, I think, an unnecessary and unphilosophical interference with the meaning of the term 'family.'

Nor is anything gained, from the point of view of the practical systematist, by establishing families which overlap in all directions.

I am so much indebted to the works of Mr. Miers, that I should be loath to criticize them in any but a friendly spirit. But it seems to me that while Mr. Miers has recognized the value of certain characters round the developments and modifications of which the Maioid Crabs easily cleave into most natural groups, he has proceeded in practice to ignore in great measure the value of his own generalization.

It appears to me that Mr. Miers' families of *Maiinea* consist each of a quite natural nucleus hidden in a loose artificial wrapping.

Beginning with the *Inachidæ* of Miers, we find a natural group, typified by such forms as *Leptopodia* and *Inachus*, linked with forms like *Anamathia*, *Xenocarcinus*, *Huenia*, *Pugettia*, *Acanthonyx*, *Doclea* and *Stenocionops*, none of which are any more nearly related to *Leptopodia* and *Inachus* than they are to any other Maioid.

In the *Maiidæ* of Miers again, we find a most arbitrary jumble of forms. Amid the confusion, however, we can discern a large natural nucleus, typified not, it is true, by *Maia*, but by such forms as *Egeria*, *Chionœcetes*, *Pisa*, *Naxia*, etc.; but these are no more nearly related to *Maia*, *Paramithrax*, *Schizophrys*, *Criocarcinus*, and *Micippa* than they are to any other Maioid.

The third family, *Periceridæ*, is even more bewildering; but as Miers himself, in his *Report on the 'Challenger' Brachyura*, has distributed many of his original Periceroid genera among the other two families, it would be unjust to enter into any detailed criticism of this family now.

The classification proposed in this paper is in many respects a reversion to the older authors.

For a most interesting and instructive historical and critical review of the Oxyrhyncha as a whole, I would refer to the Introduction of Miers' paper, already cited, in the Journal of the Linnæan Society, Zoology, Vol. XIV. 1879, pp. 634–642.

I have only to add that as almost all the new species described in this paper have been dredged by the 'Investigator,' they will be figured in next year's issue of the "Illustrations of the Zoology of the 'Investigator.'"

Tribe OXYRHYNCHA or MAIOIDEA.

Oxyrinques, Oxyrinchi, Latr. Hist. Nat. Crust. et Insect. tom. VI. p. 85.

Oxyrhinques et *Canceriens Cryptopodes*, Milne-Edwards, Hist. Nat. Crust. tom. I. pp. 263, 368.

Maioidea or *Oxyrhyncha*, Dana, U. S. Expl. Exp. Crust. Pt. I. pp. 66, 67 and 75.

Oxyrhyncha, Miers, Journ. Linn. Soc., Zool., Vol. XIV. 1879, p. 634; and 'Challenger' Brachyura, p. 2.

Carapace more or less narrowed in front, and usually produced to form a rostrum: branchial regions considerably developed, hepatic regions small. Epistome usually large; buccal cavity quadrate, with the anterior margin usually straight. Branchiæ almost always nine in number on either side*: their efferent channels open at the sides of the endostome or palate. Antennules longitudinally folded. The palp of the external maxillipeds is articulated either at the summit or at the antero-internal angle of the meropodite. The external genitalia of the male are inserted at the bases of the fifth pair of trunk-legs.

The Oxyrhyncha may be sub-divided into two families, namely :—

(1) the *Maiidæ*, in which the basal joint of the antennæ is well developed, and in which it is exceptional to find the chelipeds vastly longer than the other legs;

and (2) the *Parthenopidæ*, in which the basal joint of the antennæ is very small, and is embedded between the front and the floor of the orbit; and in which it is exceptional not to find the chelipeds vastly longer and vastly more massive than the other legs.

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* *Encephaloides* is the only Oxyrhynch known to me in which the branchiæ are less than nine in number on either side: in *Encephaloides* the reduction, both in size and number, of the anterior branchiæ seems to be due to the enormous development of the four posterior branchiæ.

Family I. MAIIDÆ.

Macropodiens and *Maïens*, Milne-Edwards, Hist. Nat. Crust. I. 272.

Maiinea, Dana, U. S. Expl. Exp. Crust. Pt. I. pp. 76 and 77, (and *Oncininea*.)

Maiinea, Miers, Journ. Linn. Soc., Zool., Vol. XIV. 1879, p. 640; and 'Challenger' Brachyura, p. 2.

Basal antennal joint well developed, and occupying all the space between the antennulary fossa and the eye.

Taking the characters sagaciously suggested by Miers, namely, the relative development of the component parts of the orbit, including basal antennal joint—as the basis of a division, the members of the family *Maiidæ* fall into four natural groups or sub-families as follows:—

Key to the Sub-families of Maiidæ.

Sub-family I. *Inachinæ.* Eyes without orbits: the eyestalks, which are generally long, are either non-retractile, or are retractile against the sides of the carapace, or against an acute post-ocular spine that affords no concealment. The basal joint of the antennæ is extremely slender throughout its extent, and is usually long:—

Alliance 1. *Leptopodioida.* Basal joint of the antennæ usually sub-cylindrical, or at any rate convex ventrally, often independent of the neighbouring structures: the external maxillipeds have the merus narrower than the ischium, and the palp large and coarse, and hence have a somewhat pediform appearance.

Alliance 2. *Inachoida.* Basal joint of the antennæ flattened or concave ventrally, and intimately fused with the neighbouring parts; its antero-external angle often produced to form a spine visible from above: the external maxillipeds have the merus at least as broad as the ischium, and the (small) palp borne at the internal angle of the merus.

Sub-family II. *Acanthonychinæ.* Eyes without true orbits: the eyestalks, which are very short or sometimes even obsolescent, are either concealed beneath a forwardly-produced supra-ocular spine, or are sunk in the sides of a huge beak-like rostrum; a postocular spine or process is sometimes present, but is not excavated for the reception of the retracted eye. The basal antennal joint is truncate-triangular. The external maxillipeds have the merus as broad as the ischium.

Sub-family III. *Pisinæ.* Eyes with commencing orbits, of which one of the most characteristic parts is a large, blunt, usually but not always isolated, cupped post-ocular process into which the eye is retractile, but never to such an extent as to completely conceal the cornea from dorsal—still less from ventral—view; there is almost always also a distinct supraocular eave, which is sometimes produced forwards as a spine: the eyestalks are short. The basal antennal joint is broad; its antero-external angle is generally produced forwards, as a spine or tooth. The external maxillipeds have the merus as broad as the ischium.

Alliance 1. *Pisoida.* Post-ocular cup distinctly isolated from the supra-ocular eave by a gap or fissure.

Alliance. 2. *Lissoida.* Post-ocular cup in the closest contact with the supra-ocular eave, a suture only intervening.

Sub-family IV. *Maiinæ.* Eyes either (1) with orbits, which may be incomplete or complete, but are always complete enough to entirely conceal the fully retracted cornea from dorsal view; or (2) but partially protected by a huge horn-like or antler-like supra-ocular spine, or by a large jagged post-ocular tooth (*Paramicippa tuburculosa*, Edw.), or by both. The eyestalks are usually long.

The orbit, when present, is formed in one of two ways; there is always an arched—often very strongly arched—supra-ocular eave, and a prominent post-ocular spine; and either (1) the interval between the eave and the spine is filled by another spine, in which case the roof of the orbit, though fissured, is fairly complete; or (2) the supra-ocular eave and the post-ocular spine are in contact with one another above, and below with a process of the basal antennal joint, in which case the orbit has not only a complete or nearly complete roof, but a complete or nearly complete floor also.

The basal antennal joint is always very broad, and is either very extensively produced outwards to aid in forming the floor of the orbit, or is armed distally with one or two large spines.

The external maxillipeds have the merus at least as wide as the ischium.

Alliance 1. *Maioida.* The orbit is formed (1) by a supra-ocular hood, the postero-external angle of which is often produced as a spine, (2) by a sharp post-ocular tooth, and (3) by a spine intercalated between the two. Basal antennal joint broad, but not specially produced to form a floor to the orbit; usually armed at both its anterior angles with a strong spine.

Alliance 2. *Stenocionopoida.* There is no true orbit; but either a huge, outstanding, often more or less hollowed, horn-like or antler-like supra-ocular spine, or a postocular tooth, or both. The basal antennal joint is broad, and either has, or has not, one or both of its anterior angles armed with a strong spine. The merus of the external maxillipeds usually has its antero-external angle strongly dilated; and the buccal frame is often much wider in front than behind.

Alliance 3. *Periceroida*. The carapace is broadened anteriorly by the outstanding, often tubular, orbits: the orbits are formed (1) by an arched supra-ocular hood, or semi-tubular horn, (2) by a hollowed post-ocular process, and (3) by a remarkable broadening, or by a prolongation, of the anterior part of the basal antennal joint; and they afford complete concealment to the retracted eye. The rostrum is often more or less deflexed.

I am afraid that this last sub-family will, at first, meet with hostile criticism; but I feel pretty sure that it is a natural group. For, taking the nature of the orbits, eyes, and basal antennal joint as the primary bond of relation, we find, if we exclude the aberrant *Stenocionopoida*, a regular gradation from the imperfect orbit and the narrower basal antennal joint of *Maia*, through the more perfect orbit and broader basal antennal joint of, *e.g.*, *Micippa thalia* and *Micippa cristata*, to the perfect tubular orbit of *Microphrys* (if *Microphrys cornutus* be the type), *Tiarinia* and *Macrocœloma*. The *Stenocionopoida* again are linked on, through *Picrocerus* and *Picroceroides*, to the *Periceroida*; and, on the other hand, through *Criocarcinus* to the Maioid *Chlorinoides*.

The following is a list of the genera of Maioid Crabs, so far as known to me, arranged in accordance with the afore-proposed classification. Within each sub-family the genera are arranged alphabetically. Indian genera are printed in roman type, and all genera known to me by autopsy are marked with an asterisk.

Complete references are not given; but only references to the best diagnoses with which I am acquainted. The bibliography of Indian genera will be found in the sequel.

Family **Maiidæ**.

Sub-family I. *Inachinæ*.

ALLIANCE I. LEPTOPODIOIDA.

* Achæus.
Achæopsis, Stimpson, Proc. Ac. Nat. Sci. Philad., 1857, p. 219.
? *Anisonotus*, A. Milne-Edwards, Miss. Sci. Mex. Crust. I. p. 195.
* Camposcia.

Cyrtomaia, Miers, 'Challenger' Brachyura, p. 14.

* Echinoplax.

Ergasticus, A. M-E., Miers, 'Challenger' Brachyura, p. 29.

Ericerus, Mary J. Rathbun, Proc. U. S. Nat. Mus., Vol. XVI. p. 223.

Leptopodia, Leach, Zool. Miscell. II. 15: Milne-Edwards Hist. Nat. Crust. I. 275 (Synonomy see Miers, Journ. Linn. Soc. Zool. XIV. 1879, p. 643).

Lispognathus, A. Milne-Edwards, Bull. Mus. Comp. Zool. Vol. VIII. 1880-81, p. 9; and Miss. Sci. Mex. Crust. I. p. 349: and Miers 'Challenger' Brachyura, p. 27.

* *Macrocheira*, de Haan, Faun. Japon. Crust., p. 88: and Miers, 'Challenger' Brachyura, p. 33.

Metoporaphis, Stimpson, Ann. Lyc. Nat. Hist., New York, Vol. VII. 1862, p. 198.

* Oncinopus.

Pactolus, Leach, Zool. Miscell. II. 19: Milne-Edwards, Hist. Nat. Crust. II. 189 .

* Paratymolus.

* Platymaia.

Pleistacantha, Miers, P. Z. S., 1879, p. 24.

Podochela, Stimpson, Ann. Lyc. Nat. Hist., New York, Vol. II. 1862, p. 194, (Synon. *Podonema*, Stimpson, Bull. Mus. Comp. Zool., Vol. II. 1870-71, p. 126).

* *Stenorhynchus*, Lamk., Milne-Edwards, Hist. Nat. Crust. I. 278 (Syn. Miers, Journ. Linn. Soc. Zool., XIV. 1879, p. 643).

New genera:—Lambrachæus, Physachæus, Grypachæus.

ALLIANCE II. INACHOIDA.

Anacinetops, Miers, Ann. Mag. Nat. Hist. 1879, Vol. IV. p. 3.

Anasimus, A Milne-Edwards, Miss. Sci. Mex. Crust. I. p. 360.

Anomalopus, Stimpson, Bull. Mus. Comp. Zool. II. 1870-71, p. 124.

* Apocremnus.

Arachnopsis, Stimpson, Bull. Mus. Comp. Zool. II. 1870-71, p. 121.

Batrachonotus, Stimpson, Bull. Mus. Comp. Zool. II. 1870-71, p. 122.

* Collodes.

* Encephaloides,

Erileptus (? = *Anasimus*), Mary J. Rathbun, Proc. U. S. Nat. Mus. Vol. XVI. 1893, page 226.

? ? ? *Eucinetops*, Stimpson, Ann. Lyc. Nat. Hist. New York, Vol.

VII. 1862, p. 191 (more probably, as Stimpson himself suggested, allied to *Micippa*).

Euprognatha, Stimpson, Bull. Mus. Comp. Zool. II. 1870-71, p. 122.

Eurypodius, Guérin; Milne-Edwards, Hist. Nat. Crust. I. 283.

Gonatorhynchus, Haswell, Cat. Austral. Crust., p. 10.

Halimus, Latr., Edw., Milne-Edwards, Hist. Nat. Crust. I. 340.

* *Inachus*, Fabr., Edw., Milne-Edwards, Hist. Nat. Crust. I. 286.

* Inachoides.

* *Microhalimus*, Haswell, Cat. Austral. Crust., p. 7.

Neorhynchus, A. Milne-Edwards, Miss. Sci. Mex. Crust. I. p. 186, (=*Microrhynchus*, Bell, P. Z. S., 1835, p. 88, and Trans. Z. S. II. 1841, p. 40).

Oregonia, Dana, U. S. Expl. Exp. Crust. I. p. 105.

Pyromaia, Stimpson, Bull. Mus. Comp. Zool. II. 1870-71, p. 109.

* *Trichoplatus*, A. Milne-Edwards, Ann. Sci. Nat. (6) IV. 1876, Art. 9, p. 2.

Sub-family, II. *Acanthonychidæ.*

* Acanthonyx.

Antilibinia, Macleay, in Smith's Ill. Zool. S. Africa, p. 56.

Cyclonyx, Miers, Ann. Mag. Nat. Hist., 1879, Vol. IV. p. 6.

Dehaanius, Macleay, in Smith's Ill. Zool. S. Africa, p. 57.

Epialtus, Milne-Edwards, Hist. Nat. Crust. I. 344.

Eupleurodon, Stimpson, Ann. Lyc. Nat. Hist. New York, Vol. X. 1874, p. 98.

Goniothorax, A. Milne-Edwards. Bull. Soc. Philom. (7) III. 1878-79, p. 103.

* Huenia.

Leucippa, Milne-Edwards, Hist. Nat. Crust. I. 345.

Mimulus, Stimpson, Ann. Lyc. Nat. Hist., New York, Vol. VII. 1860, p. 199.

Peltinia, Dana, U. S. Expl. Exp. Crust. I. p. 129.

* Menæthius.

Mocosoa, Stimpson, Bull. Mus. Comp. Zool. II. 1870-71, p. 128.

* Pugettia.

? * Scyramathia.

* Simocarcinus.

* Sphenocarcinus, (? = *Oxypleurodon*, Meirs, 'Challenger' Brachyura, p. 38.)

Trigonothir, Miers, Ann. Mag. Nat. Hist. 1879, Vol. IV. p. 4.

* Xenocarcinus.

Sub-family III. *Pisinæ.*

ALLIANCE I. PISOIDA.

Arctopisis, Lamk. see Pisa emend. Miers, *infra*.

Acanthophrys, A. Milne-Edwards (as limited by Miers, J. L. S. Zool. XIV. 656), Ann. Soc. Entom. Fr. (4) V. 1865, p. 141, pl. v. fig. 3.

* *Anamathia*, Roux; Milne-Edwards, Hist. Nat. Crust. I. 285.

Chionœcetes, Kroyer; Miers, Journ. Linn. Soc. Zool. XIV. 1879, p. 654 (Syn. *Peloplastus*, see Miers, J. L. S., Zool. XIV. 654).

* Chorilibinia.

Chorinus, Leach; Milne-Edwards, Hist. Nat. Crust. I. 314.

* Doclea.

* Egeria.

? *Esopus*, A. Milne-Edwards, Miss. Sci. Mex. Crust. I. p. 89.

* *Eurynome*, Leach; Milne-Edwards, Hist. Nat. Crust. I. 350.

Hoplopisa, A. Milne-Edwards, Bull. Soc. Philom. (7) II. 1877-78, p. 222; and Miss. Sci. Mex. Crust. I. p. 201.

* *Hyas*, Leach; Milne-Edwards, Hist. Nat. Crust. I. 311.

* Hyastenus (*Syn.* Lahainia *and* Chorilia.)

Lepteces, Mary J. Rathbun, P. U. S. N. M., Vol. XVI. 1893, p. 83.

Libidoclea, Edw. and Lucas, Voy. Amer. Merid. Crust., p. 6.

* *Libinia*, Leach; Milne-Edwards, Hist. Nat. Crust. 1. 298.

Lepidonaxia, Zool. Record, 1877, Crust., p. 11.

Loxorhynchus, Stimpson, Journ. Bost. Soc. Nat. Hist., Vol. VI. 1857, p. 451.

* Naxia (*Syn.* Naxioides *and* Podopisa).

? *Nibilia*, A. Milne-Edwards, Miss. Sci. Mex. Crust. I. p. 132.

Notolopas, Stimpson, Ann. Lyc. Nat. Hist. New York, X. 1874, p. 96.

Pelia Bell, Trans Zool. Soc. II. 1841, p. 44.

* *Pisa*, Leach, Miers; Miers, 'Challenger' Brachyura, p. 53.

? *Pisoides*, Edw. and Lucas, Voy. Amer. Merid. Crust., p. 10.

Prionorhynchus, Jacquinot and Lucas, Voy. Pôle Sud, l'Astrolabe et la Zélée, tom. III. Crust., p. 5.

? *Pyria*, Dana, U. S. Expl. Exp. Crust. I. p. 96.

Rachinia, A. Milne-Edwards, Miss. Sci. Mex., pl. xviii., fig. 1 (if this genus is distinct from *Scyramathia*).

Salacia, Edw. and Lucas, Voy. Amer. Merid. Crust., p. 12.

Scyra, Dana, U. S. Expl. Exp. Crust. I. p. 95.

? * Scyramathia (*Syn.* ? *Rachinia*).

Trachymaia, A. Milne-Edwards, Bull. Mus. Comp. Zool. VIII. 1880-81, p. 3; and Miss. Sci. Mex. Crust. I. p. 351.

ALLIANCE II. LISSOIDA.

? *Coelocerus*, A. Milne-Edwards, Miss. Sci. Mex. Crust. I. p. 84.

Herbstia, Milne-Edwards, Hist. Nat. Crust. I. 301 (Syn. *Rhodia*, Bell, T. Z. S. II. 1841, p. 43; *Micropisa*, Stimpson, Proc. Ac. Nat. Sci. Philad., 1857, p. 217: *Herbstiella*, Stimpson, Ann. Lyc. Nat. Hist. New York, X. 1874, p. 93).

* Hoplophrys.

Lissa, Leach; Milne-Edwards, Hist. Nat Crust. I. 310.

Parathoe, Miers, Ann. Mag. Nat. Hist, 1879, Vol. IV. p. 16.

Perinea, Dana, U. S. Expl. Exp. Crust. I. p. 114.

* Tylocarcinus.

Sub-family IV. *Maiinæ*.

ALLIANCE I. MAIOIDA.

* Cyclax (Cyclomaia).

* Maia.

Maiella, Ortmann, Zool. Jahrb. Syst. &c., VII. 1893-94, p. 51.

Maiopsis, Faxon, Bull. Mus. Comp. Zool., XXIV. 1893, p. 150.

Nemausa, A. Milne-Edwards, Miss. Sci. Mex. Crust. I. p. 80.

* Paramithrax (* Leptomithrax, * Chlorinoides).

? *Phycodes*, A. Milne-Edwards, Rev. et Mag. Zool. (2) XXI. 1869, p. 374.

? *Pleurophricus*, A. Milne-Edwards, Journ. Mus. Godeffr., I. Crust. p. 260.

* Schizophrys (Dione).

Temnonotus, A. Milne-Edwards, Miss. Sic. Mex. Crust. I. p. 82.

ALLIANCE II. STENOCIONOPOIDA.

* Criocarcinus.

? *Eucinetops*, Stimpson, Ann. Lyc. Nat. Hist. New York, VII. 1862, p. 191.

* *Paramicippa*, Edw. Milne-Edwards, Hist. Nat. Crust. I. 332.

Picrocerus, A. Milne-Edwards, Ann. Soc. Ent. Fr. (4) V. 1865, p. 136.

Pseudomicippa, Heller, Crust. Roth. Meer., SB. Ak. Wien, XLIII. 1861, p. 301; and Miers 'Challenger' Brachyura, p. 68 (*nec syn.* Microhalimus).

Stenocionops.

Stilbognathus, E. Martens, Verh. zool.-bot. Ges. Wien, XVI. 1866, p. 379.

Tyche, Bell, P. Z. S. 1835, p. 172, and T. Z. S. II. 1841, p. 58 (*syn.* *Platyrinchus*, Desbonne and Schramm, Crust. Guadeloupe, p. 3).

ALLIANCE III. PERICEROIDA.

? *Ala*, Lockington, Proc. Calif. Acad. Sci. VII. 1876, p. 65.

Anaptychus, Stimpson, Ann. Lyc. Nat. Hist. New York, VII. 1862, p. 183.

? *Coelocerus*, A Milne-Edwards, Miss. Sci. Mex. Crust I. p. 84.

Cyclocoeloma, Miers, Ann. Mag. Nat. Hist. 1880, Vol. V. p. 228.

* Cyphocarcinus.

Hemus, A. Milne-Edwards, Miss. Sci. Mex. Crust. I. p. 88.

Leptopisa, Stimpson, Bull. Mus. Comp. Zool. II. 1870-71, p. 114.

* Macrocoeloma (Entomonyx: both these genera of Miers seem to me to be synonymous with *Micippoides* of A. Milne-Edwards.)

* Micippa.

Micippoides, A. Milne-Edwards, Journ. Mus. Godeffr. I. Crust. 254 (probably *Macrocœloma* and *Entomonyx* may be here included).

* *Microphrys*, Edw.; Milne-Edwards, Ann. Sci. Nat. Zool. (3) XVI. 1851, p. 251; and Miers, 'Challenger' Brachyura, p. 82 (*syn. Milnia*, Stimpson, Ann. Lyc. Nat. Hist. New York, VII. 1862, p. 179: *Omalacantha*, Hale Streets, Proc. Ac. Nat. Sci. Philad. 1871. p. 238; and A. Milne-Edwards, Miss. Sci. Mex. Crust I. p. 64: *Fisheria*, Lockington, Proc. Calif. Ac. Sci, VII. 1876, p. 72.

Mithrax, Leach; Milne-Edwards, Hist. Nat. Crust. I. 317; and Miers, 'Challenger' Brachyura, p. 84 (*syn. Mithraculus*, White, *vide* Miers. J. L. S., Zool. XIV. 1879, p. 667: *Teleophrys*, Stimpson, Amer. Journ. Sci and Arts. (2) XXIX. 1860, p. 133.)

Othonia, Bell (*Pitho*, Bell, P. Z. S. 1835, p. 172: *Othonia*, Bell T. Z. S. II. 55): and A. Milne-Edwards, Miss. Sci. Mex. Crust. I. p. 114.

Pericera, Latr., Edw.; Milne-Edwards, Hist. Nat. Crust. I. 334; and Miers, 'Challenger' Brachyura, p. 76.

Picroceroides, Miers, 'Challenger' Brachyura, p. 77.

(This genus, though placed in this alliance on account of the structure of the orbits and basal antennal joint, is in many respects more closely allied to the Stenocionopoida).

Sisyphus, Desbonne Schramm, Crust. Guadeloupe, p. 20.

? *Thoe*, Bell, P. Z. S., 1835, p. 171: A. Milne-Edwards, Miss. Sci. Mex. Crust. I. p. 120 (*syn.*, *sec.* Miers J. L. S. Zool. XIV. 667; *Platypes*, Lockington, Proc. Calif. Ac. Sci. VII. 1876, p. 41).

* Tiarinia.

The genus *Podohuenia*, placed among the Periceridæ in the Zoological Record for 1892 (Crust., p. 17), is inaccessible to me. The reference in the Zoological Record is to Boll. Soc. Nat. Napoli, III. 1889, p. 180.

Sub-family INACHINÆ (see Table I.).

Alliance I. LEPTOPODIOIDA (see Table I.).

LAMBRACHÆUS, n. gen.

Closely allied to *Leptopodia* and *Metoporaphis*, from which it differs (1) in its extremely long sub-cylindrical neck, (2) in its minute antennæ and (3) in the *Lambrus*-like proportions of its chelipeds.

Eyes antennules and antennæ borne at the end of a long narrow subcylindrical "neck," which is continued onwards as an extremely long slender spiny rostrum.

Eyes stoutish, salient and non-retracticle: no defined orbits: a small postocular spine. Antennæ minute, exposed to dorsal view. Chelipeds stout and extremely long, with long sub-cylindrical palms and short fingers.

Legs very slender: shorter than the chelipeds.

Lambrachæus ramifer, n. sp., Plate III. fig. 1.

The body is formed by (1) a small trunk, (2) a long narrow almost cylindrical prestomial "neck," and (3) a long slender sinuous spiny rostrum shaped like a withered branch.

The carapace proper is trilobed, the lateral lobes being formed by the branchial regions, and the front lobe being formed by the wings of the buccal frame.

The "neck," at the end of which are borne the eyes, antennules, and antennæ, is rather longer than the carapace proper.

The rostrum is nearly twice the combined length of the neck and carapace.

The eyes are salient and non-retractile, and though there is a narrow dorsal eave round the base of the eyestalks and a pair of tiny postocular spines, there is nothing like an orbit present. The cornea is surmounted by a little tooth.

The antennæ are minute and filiform, and are completely exposed: their total length is not one-sixth that of the rostrum.

The antennules are of large proportions: they fold longitudinally, but when folded are much beyond the capacity of the narrow shallow antennulary fossæ.

The external maxillipeds have broad endopodites, and completely cover the buccal frame: the merus is expanded in both directions, but most at its internal angle, so that the flagellum is inserted nearer to the external angle.

The chelipeds, though actually slender, are relatively to the carapace as stout and long as those of the longer-armed species of *Lambrus:* they are one-third longer than the combined carapace neck and rostrum: they are sub-cylindrical and spiny: their proportions are much those of *Lambrus*, the fingers being not much more than a quarter the length of the palm. The fingers are curved, and are in contact only at their tips.

The legs, which are very slender and are not quite so long as the chelipeds, display no remarkable characters.

The figure, which represents a male magnified two diameters, shows the proportions better than any table of measurements.

Loc. Port Blair, Andaman Islands.

ACHÆUS, Leach.

Achæus, Leach, Malac. Podophth. Brit., Tab. XXII. fig. C.

Achæus, Desmarest, Consid. Gen. Crust., p. 153.

Achæus, Milne-Edwards, Hist. Nat. Crust. I. 281.

Achæus, Miers, Journ. Linn. Soc., Zool., Vol. XIV. 1879, p. 643; and 'Challenger' Brachyura, p. 8.

Carapace triangular with the branchial regions swollen, always more or less constricted behind the eyes. Rostrum very short, bifid. Eye-stalks long and hardly retractile backwards: no orbits or post-ocular spine. Antennæ with the basal joint very slender, sub-cylindrical, the other joints and the flagellum completely exposed. External maxillipeds with the meropodite long, narrower than the ischiopodite, and carrying the next joint at, or near, its apex. Chelipeds short, not very stout. Legs slender, sometimes long and filiform: the dactyli of those of the last two pairs more or less falcate. Abdomen consisting of six segments in both sexes.

As Miers has remarked, this genus is distinguished from *Stenorhynchus* only by the form of the rostrum, which consists of two short lobes instead of two long spines.

Key to the Indian species of the genus Achæus.

- I. Carapace with a post-ocular constriction, but with no long post-ocular "neck:" dactyli of last pair, or two pair, of legs strongly falciform:—
  - 1. Carapace and eye-stalks smooth ... *A. lacertosus.*
  - 2. Carapace with a bilobed prominence on the cardiac region: eye-stalks with a tubercle on the anterior surface:—
    - i. Gastric region smooth ... ... *A. affinis.*

ii. Gastric region with a sharp tubercle or spine ... ... *A. spinosus.*

II. Carapace with a long post-ocular neck: dactyli of last pair of legs hardly curved :—

1. Lobes of rostrum with a spinate carina: median tubercles of carapace low and blunt ... *A. cadelli.*
2. Lobes of rostrum with a smooth carina: median tubercles of carapace sharp and elevated *A. tenuicollis.*

Achæus tenuicollis, Miers.

Achæus tenuicollis, Miers 'Challenger' Brachyura, p. 9, Pl. I. fig. 3.

"The body is thinly clothed with short curled hairs; the limbs with similar hairs, interspersed among which are some longer ones. The carapace is subtriangulate, little longer than broad, with a neck-like constriction behind the orbits, and armed with spines as follows :—Three conical spines upon the gastric and another upon the cardiac region, two shorter conical spines or tubercles whereof the anterior is the smallest, on each branchial region, behind these one very small on the posterior margin of the carapace, and another on the sides of the branchial regions above the bases of the chelipedes; also a small spine upon the rounded, lateral, hepatic protuberance, and another behind this, on the pterygostomian region; there is also a strong spinule on the upper margin of the orbit, above the eye-peduncles. The lobes of the rostrum are short, and terminate each in a spine. The sternal surface of the body bears a few spinules. The post-abdomen of the male, is as usual, six-jointed (the two last joints having coalesced). The eye-peduncles are robust, with the corneæ protuberant; a small spinule exists on the inferior margin of the eye-peduncle, and another on the upper margin of the eye, near the distal extremity. The antennules are lodged in deep longitudinal fossettes; the very slender basal joint of the antennæ is joined with the front at its distal extremity and bears several small spinules on its inferior surface, the following joint is short, the next about as long as the basal joint, flagella slender; the ischium-joint of the outer maxillipedes is produced at its inner and distal angle which is rounded and bears several spinules on its outer surface, as does also the merus-joint which is rounded, not truncated, at the distal extremity where it bears the next joint. The chelipedes (in the male) are rather slender, and longer than the body; with the joints clothed with rather long hairs; ischium and merus-joints with a series of spinules on their antero- and postero-inferior faces, wrist about as long as palm, with a few spinules hardly discernible amid the hairs which clothe this joint, palm slightly compressed, not dilated, armed with spinules on its upper and lower margins, fingers about as long as palm, and slightly incurved at the apices which are nearly destitute of hair; the ambulatory legs are very slender and elongated; the dactyli of the first three pairs are short and nearly straight, in the last pair only are they slightly falciform. Colour (in spirit) light yellowish-brown." (Miers).

A single specimen is included in the Museum collection: the locality is not quite certain, but it came most probably from the Andamans.

Achæus cadelli, n. sp. Plate V. fig. 1.

In general form and proportions much resembling *Achæus lorina* (Ad. & White), from which it differs in having the legs even more slender, and the eye-stalks quite smooth.

The regions of the pyriform carapace are well demarcated, the hepatic regions being each produced to form a strong sharp tooth. There are three elevations, arranged in triangle, on the gastric region, and two, side by side, on the cardiac region.

The rostrum has the usual *Achæus*-form, but each lobe is dorsally carinate, the carina being spinate or serrate.

Behind the rostrum is a long constricted "neck," more pronounced even than that of *A. tenuicollis* and *brevirostris*.

The chelipeds are of the usual form. The legs are extremely long and slender, those of the second trunk segment being about five times the length of the carapace, rostrum included. The dactyli of the 4th and 5th pairs are hardly falciform. Length of carapace, 7 millim: greatest breadth of carapace, 4 millim.: length of 2nd pair of trunk-legs, 36·5 millim.

Loc. Andamans.

Achæus spinosus, Miers.

Achæus spinosus, Miers, Japanese and Corean Crustacea, in Proc. Zool. Soc., 1879, p. 25.

Carapace triangular, narrowed behind the eyes, and armed with six spines above, namely: one on the gastric, one—bilobed—on the cardiac, and two on each branchial region: there are also some spines or sharp tubercles on the ventrad aspect of the hepatic and branchial regions. The rostrum is small and bilobed. The eye-stalks are robust, and have a strong tubercle near the middle of the anterior surface. Chelipeds in the male robust, the arm and wrist granular above, the palm swollen, with about six spinules on the upper margin and a few granules on the lower margin near its base: fingers, in the male, acute with a wide hiatus at base when closed, both with a strong tooth on their opposed margins near the base, and with the outer margins carinate. In the female the chelipeds differ only in being much less robust, and in having the fingers much more closely apposable and toothless. Ambulatory legs long and slender: the dactylus of the last pair strongly falcate.

[The basal antennal joint has one or two spines at its distal end, and the free portion of the antenna is much shorter than the carapace.]

Length of adult, 6 to 7 millim.

In the Museum collection, from the Persian Gulf. Ex coll. W. T. Blanford.

Achæus lacertosus, Stimpson.

Achæus lacertosus, Stimpson, Proc. Acad. Nat. Sci. Philad., 1857, p. 218.

Achæus breviceps, Haswell, Proc. Linn. Soc., N. S. Wales, Vol. IV. 1879, p. 433 (*sec.* Haswell).

Achæus lacertosus and *breviceps*, Haswell, Cat. Austr. Stalk and Sess. eyed Crust., p. 3.

Achæus lacertosus Miers, Zool. "Alert," pp. 181 and 188; and "Challenger" Brachyura, p. 8.

Achæus lacertosus, J. R. Henderson, Trans Linn. Soc., Zool., 1893, p. 341.

Carapace triangular, with the regions fairly well delimited and the surface quite smooth beneath a slight pubescence: hepatic region with a horizontal laminar tooth. Rostrum as long as wide, bilobed. Antennæ filiform, the free portion longer than the carapace. Eye-stalks long, slender, smooth. Chelipeds much stouter than the other legs, the meropodite being the stoutest joint, and the hand being incurved and the fingers compressed. The ambulatory legs are long and slender, the first pair being more than three times the length of the carapace: the dactyli of the last two pairs are strongly falcate.

Length of adult about 6 millim.

In the Museum collection are numerous specimens from the Andamans, from Palk Straits, and from the Orissa Coast.

Achæus affinis, Miers.

Achæus affinis, Miers, Zoology of the 'Alert,' pp. 181 and 188, and "Challenger" Brachyura, p. 8.

Achæus affinis, de Man, Archiv. f. Naturges., LIII. 1887, p. 218.

Achæus affinis, Henderson, Trans. Linn. Soc., Zool. (2) V. 1893, p. 341.

Achæus affinis, Ortmann, Zool. Forsch. in Austr. and Malay Arch., Jena, 1894, p. 37.

"Carapace subtriangular and moderately convex, with the surface uneven, but the regions not very distinctly defined; the post-orbital region is constricted. The rostrum is moderately prominent, the frontal lobes very small and subacute. On the cardiac region is a bilobated prominence, which is usually very much elevated; there is a small angulated prominence on the hepatic regions, and occasionally one or two granules on the branchial regions, which are not at all convex. Eye-peduncles with a blunt tubercle in the middle of their anterior margins. The merus-joints of the outer maxillipedes are narrowed and subacute at their distal ends, where they are articulated with the next joints. The chelipedes (in both sexes) are rather slender; margins of the arm, wrist, and palm usually with a few granules or spinules; merus somewhat trigonous; fingers as long as the palm, and somewhat incurved, with their inner margins denticulated, and having between them when closed (in the males) a small hiatus at base. The ambulatory legs are slender, filiform, and very much elongated, the second legs being, in an adult male, four times as long as the postfrontal portion of the carapace; the dactyli of the two posterior pairs only are distinctly falciform; both chelipedes and ambulatory legs are scantily clothed with long hairs. Length of carapace (including rostrum) of an adult male about 5 lines (10·5 millim.), breadth about 3 lines (6 millim.); length of second leg about 1 inch 8 lines (42 millim.); an adult female has the carapace relatively somewhat broader, length nearly 5½ lines (12 millim.), breadth 4 lines (8·5 millim.).

The bilobated prominence on the cardiac region and tuberculated eye-peduncles serve to distinguish this species." (Miers).

This species is included in the Indian Fauna on the authority of Professor Henderson: there are no specimens in the Indian Museum collection.

PARATYMOLUS, Miers.

Paratymolus, Miers, P. Z. S., 1879, p. 45.

Paratymolus, Haswell, Ann. Mag. Nat. Hist., 1880, Vol. V. p. 302; and Cat. Austr. Crust., p. 142.

Paratymolus, Ortmann, Zool. Jahrb. Syst., &c., VII. 1893-94, p. 34.

I agree with Ortmann in placing this genus among the *Achæus*-like Maiidæ: the position of the external genitalia of an ovigerous female in the Museum collection is conclusive.

Carapace elongate-subpentagonal, not depressed.

Eye-stalks long, slender, salient, non-retractile: no orbits or preocular and post-ocular spines. Antennules longitudinally folded beneath the rostrum.

Antennæ long, exposed, dorsally, in the greater part of their extent: the basal joint slender, but so short as hardly to reach the front.

Rostrum short, emarginate, distinctly delimited from the carapace. Epistome short.

External maxillipeds with the merus narrower than the ischium, and bearing the flagellum at the antero-internal angle.

Legs not elongate: dactyli slender, straight.

Paratymolus hastatus, n. sp. Plate V. figs. 4, 4*a*.

Carapace somewhat elongate-pentagonal or ovoid, with the rostrum sharply demarcated, and with the regions undefined.

Gastric region with three sharp tubercles disposed in a triangle, base forwards: cardiac region with a single tubercle: branchial regions each surmounted by an oblique crest of 2 or 3, and with a lateral marginal row of 2 or 3, sharp tubercles: hepatic regions each with two sharp lateral teeth, the posterior of which is large. Rostrum short, emarginate, deeply and broadly grooved dorsally.

Eye-stalks long, laterally projecting, slightly moveable forwards but not retractile. Eyes tipped with two or three stiff setæ. No orbits, and nothing in the shape of orbital spines except a slight angular emargination of the base of the rostrum.

Antennæ as long as the post-orbital portion of the carapace, and visible, dorsally, from the base of the second joint of the peduncle: the basal joint, which alone is concealed, although slender is short, hardly reaching the front.

External maxillipeds with the merus broad, but not so broad as the ischium, and giving insertion to the palp at the antero-internal angle.

Trunk-legs with a few coarse stiff setæ: the 2nd pair, which are slightly the longest, are a little less than twice the length of the carapace without the rostrum.

Chelipeds characterized by the carpus, which has its antero-internal angle produced obliquely to form a great spike, the point of which reaches almost to the base of the fingers.

Length of carapace 6 millim. Breadth of carapace 4·5 millim. Length of 2nd pair of legs 10·5 millim.

An egg-laden female from the Andamans; in which I am satisfied that the genital orifices are not on the bases of the third pair of legs, but on the sternum.

PHYSACHÆUS, n. gen.

Closely allied to *Achæus*, from which it is distinguished chiefly by the form of the basal joint of the antennary peduncle, which is long and slender, and is fused near its distal end with the tip of the rostrum.

General form that of an *Achæus* with the pterygostomian and branchial regions so inflated as to push forwards the epistomial region to a plane almost at right angles with the antennary region.

Eyes small, slender, rigidly immovable,—in short undergoing degeneration. No orbits or orbital spines.

Rostrum very short, bifid, at tip, the point of each tooth being fused with the distal end of the (otherwise free) sub-cylindrical basal joint of the antennary peduncle. Antennæ of great length.

External maxillipeds with the merus rounded and slightly produced beyond the articulation—at the antero-internal angle—of the palp: the merus much narrower than the ischium. Legs long and slender, with long filamentous dactyli. Chelipeds short.

Physachæus ctenurus, n. sp. Plate III. figs. 2, 2 *a-b*.

Carapace sub-triangular, globosely inflated, with all the regions, except the cardiac, tumid and fairly well delimited, and with a strong post-ocular constriction, beneath which there is an almost vertical descent to the mouth.

The rostrum, which is small, consists of two narrow, slightly divergent, hollow teeth, to either apex of which the distal end of the otherwise perfectly free basal joint of the corresponding antennary peduncle is fused.

Two large erect procurved spines occur in the middle line of the carapace; one on the posterior part of the gastric region, the other behind the cardiac region: on either side of the former, but in a plane anterior to it, there may sometimes be a spinule.

In both sexes the abdomen is bluntly but strongly carinated down the middle line, the carina in the case of the male ending on the 6th tergum in a huge recurved spine: in the female instead of a spine there is a small tubercle, and the posterior edge of the sixth tergum bears a row of four spines.

The eye-stalks are very small, and are rigidly fixed at right angles to the rostrum: the corneæ are almost devoid of pigment. There are no orbits or orbital spines.

The antennæ are distinctly exposed from their base, and are half as long again as the entire carapace, between one-third and two-fifths of their extent being formed by the slender peduncle. The basal joint is slender and almost cylindrical: it is quite free from neighbouring parts, except at the distal end, which is fused with the tip of the rostrum. The flagella are fringed with long hairs.

The antennules are large, and fold longitudinally within the hollow teeth of the rostrum. Except in regard of the fingers, the chelipeds have much the same form as, though slenderer proportions than, those of *Stenorhynchus*, but the merus is much more strongly and elegantly curved: the merus and carpus are moderately inflated, the former joint, like the ischium, having its lower edge more or less granulate: the palm is compressed, with the edges denticulate: the fingers are strongly compressed, and have the cutting edges accurately and completely apposable throughout, being denticulate near the tips only.

In the female the chelipeds have the same general form as in the male, but differ in having the lower edge of the ischium and merus strongly spinate. The legs are slender and filiform, about one-fourth of their length being contributed by the filamentous dactylus: those of the third trunk-segment are the longest, being about four times the length of the carapace, rostrum included, and more than two-and-a-half times the length of the chelipeds.

	Male.	Female.
Length of carapace	7·2 millim.	... 8·5 millim.
Breadth of carapace	6·0 ,,	... 7·0 ,,
Length of legs of 2nd trunk-segment	28·0 ,,	... 28·0 ,,
,, ,, 3rd ,, ,,	32·0 ,,	... 32·0 ,,

Numerous males and egg-laden females from the Andaman Sea, 240 to 375 fathoms.

The eggs are few in number and are singularly large, those from a female of the dimensions given above being over a millimetre in diameter.

Physachæus tonsor, n. sp. Plate III. fig. 3.

The female, which is the only sex represented in the collection, differs from the female of *Physachaeus ctenurus* in the following particulars:—

(1) the gastric region of the carapace, instead of a single large spine, has several smooth tubercles; and the large spine behind the cardiac region is coarser, and is recurved instead of procurved: the post-ocular constriction is less marked:

(2) the abdominal carina ends in a spine, and the sixth tergum has its after edge perfectly smooth instead of quadrispinate:

(3) the eye-stalks are larger, and are compressed instead of cylindrical:

(4) the chelipeds are relatively stouter, being of much the same proportions as those of the male of *Physachæus ctenurus*: their merus is compressed and has its lower border very strongly and sharply carinated: the hands are much thinner and more compressed; the palm

having its lower edge, and the fingers their outside edges, sharply cristate:

(5) the legs of the second, not of the third, trunk-segment are the longest, and considerably so.

Length of carapace 11 millim. Breadth of carapace 9·5 millim. Length of legs of 2nd trunk-segment 47 millim., of 3rd trunk-segment 40 millim.

Two egg-laden females from the Andaman Sea, 271 fathoms.

The eggs, as in the preceding species, are large and few in number.

The above species represent an *Achæus* modified for life at a considerable depth. The branchial chambers, as is very commonly the case in deep-sea Malacostraca, are greatly inflated: the eyes have degenerated, and the antennæ—no doubt in compensation—have become remarkably lengthened: while the auditory tubercles also, it may be mentioned, are large and prominent.

GRYPACHÆUS, n. gen.

Intermediate between *Achæus* and *Echinoplax.*

Carapace triangular, spiny, separated from the frontal region by a post-ocular "neck." Rostrum spiny: composed of two short divergent spinelets, with a strong median deflexed (interantennulary) spine, not visible from above. Eyes laterally projecting, movable, but not sufficiently retractile to be ever concealed. Small supra-ocular and post-ocular spines are present as part of the general spinature. Antennæ dorsally exposed from the basal joint of the peduncle, which joint is long slender cylindrical and spiny. External maxillipeds with the merus elongate, much narrower than the ischium, and not much broader than the carpopodite. Legs hairy and spiniferous. Abdomen six-jointed in ♀.

Grypachæus hyalinus (Alcock & Anderson). Plate III. figs. 4, 4*a*.

Achæus hyalinus, Alcock & Anderson, J. A. S. B., Pt. ii. 1894, p. 205.

Carapace sub-triangular, thin, vitreous, spiny especially in its anterior half: the regions well delimited, and the post-ocular portion constricted to form a "neck." The rostrum, as seen from above, ends in two short spines, each of which has a spine at its base; but from in front or from below it shows a strong vertically deflexed (interantennulary) spine.

The eyes are large; and the long eye-stalks, which bear two tubercles on their front surface, are movable backwards, and are exposed from their base in all positions. The antennæ are visible, dorsally, from the end of the basal joint of the peduncle, which joint is long, slender, cylindrical and spiny.

The external maxillipeds are large, hairy, and almost pediform, owing to the narrowness of the merus and the coarseness of the palp.

The trunk-legs are hairy and spiny, the hairs on the 2nd and 3rd pairs being remarkably long, stiff, and closely and evenly set. The arm, wrist, and hand of the chelipeds—but especially the arm—are acutely spiny, as are also the edges of the meropodites of the legs,—the spinature of the front edge of the meropodites of the 2nd and 3rd pairs being particularly prominent. The fifth pair of legs are sub-chelate, the propodite having its proximal end strongly dilated to receive the folded-back dactylus : the apposed edge of the dactylus is minutely, that of the propodite sharply and conspicuously, spinate.

Length of carapace 14 millim. Breadth of carapace 9 millim. Greatest span (between extended 2nd pair of trunk-legs) 67 millim.

Loc. Off Trincomalee 28 fms. Females only.

ECHINOPLAX, Miers.

Echinoplax, Miers, "Challenger" Brachyura, p. 31.

Carapace sub-pyriform, longer than broad, and covered with very numerous closely-set spines and spinules : orbital margin spinose : spines of rostrum acute, divergent from their bases, and bearing several accessory spinules. Post-abdomen seven-jointed. Basal antennal joint slender, spinuliferous, and in contact with the front at the distal extremity : flagellum visible from above at the sides of the rostrum. Maxillipeds with the merus narrower than the ischium, and the palp coarse ; merus truncated and not notched at the distal extremity, the antero-lateral angle not produced. Legs spinuliferous. Chelipeds in the female [as in the male] slender and feeble, with the palms not dilated. Ambulatory legs considerably elongated, with the penultimate joint not dilated ; the dactyli nearly straight.

Key to the Indian Species of Echinoplax.

Carapace with the regions well defined : rostrum in the adult considerably less than half the length of the carapace :—

1. Carapace and abdominal terga closely covered with pungent acicular spines of equal size ... *E. pungens.*
2. Carapace and abdominal terga finely granular, with a few definitely placed spines of conspicuous size ... ... *E. rubida.*

Echinoplax pungens, Wood-Mason.

Echinoplax pungens, Wood-Mason, Ann. Mag. Nat. Hist., March, 1891, p. 259.

Carapace pyriform, convex, with the regions well delimited; densely covered, as are also the sterna, chelipeds, ambulatory legs, and external maxillipeds, with pungent acicular spines. The abdominal terga of the male and young female are also similarly spiny, but in the adult female they become only distantly and coarsely granular.

The rostrum consists of two slender curved divergent spines—less than one-third the length of the carapace proper—the outer and lower surfaces of which are extremely spiny.

The eye-stalks, which have the anterior surface closely spinulate, are retractile, but not to the extent of concealment: there is a strong post-ocular spine—to which, however, the retracted eye does not nearly reach—and numerous smaller spines along the supra-ocular and infra-ocular margins. The antennæ are visible from above, from the middle of the second joint of the peduncle: the peduncle is spiny, with all the joints very slender: the flagellum reaches a little beyond the tip of the rostrum.

The interantennulary spine is large and deeply bifid.

The chelipeds, which are alike in form in both sexes—though relatively longer in the male—are not stouter than the ambulatory legs, and are rather longer than the carapace and rostrum.

The legs of the next pair are more than twice, and those of the third pair rather less than twice the length of the chelipeds, while the fourth and fifth pairs decrease considerably in length: the dactyli of all are densely covered with a brushwork of setæ.

	Male (adult).	Female (adult).
Length of carapace and rostrum ...	70 millim.	79 millim.
Greatest breadth of carapace ...	47 ,,	57 ,,
Length of cheliped	76 ,,	75 ,,
,, ,, 2nd pair	158 ,,	191 ,,

Andaman Sea, 130–250 fathoms.

A figure of this fine species has been drawn for "Illustrations of the Zoology of the 'Investigator'" for 1896.

Echinoplax rubida, n. sp.

Differs from *Echinoplax pungens*, specimens of the same sex, and of approximately the same size being compared, in the following particulars:—

1. The carapace, instead of being everywhere covered with pun-

gent acicular spines of uniform size, is finely granular, with certain definitely placed distant thornlike spines of conspicuous magnitude, namely :—four in triangle on the gastric region, two side by side on the cardiac region, two side by side on the intestinal region, three on each hepatic region, and three on each branchial region: besides these there are some smaller spines on the lateral aspect of the pterygostomian and branchial regions:

2. The rostral spines are less divergent, and have elegantly curved tips:

3. The abdominal terga (of the young female), instead of being everywhere closely covered with pungent spines, are merely finely and distantly granular, with a single large spine on the first tergum, and a pair of smaller spines on the second, in the middle line:

4. The legs are much less spiny, the propodites of the ambulatory legs being fringed with stiff bristles instead of spines:

5. The colour differs, being, in spirit specimens, a warm brown, instead of a pale yellow.

It differs from *Echinoplax moseleyi*, Miers, judging from the figures and description, in the following particulars :—

1. The regions of the carapace are well delimited by sharp cut grooves:

2. The rostral spines are considerably less than half the length of the carapace proper:

3. The armature is altogether different, the large stout spines of the present species standing out on a finely granular carapace, and the abdominal terga being distantly granular.

Total length of carapace 35 millim., breadth of carapace 21 millim., greatest span (2nd pair of trunk-legs) 150 millim.

Loc. Andaman Sea, 90 to 177 fathoms.

PLATYMAIA, Miers.

Platymaia, Miers, 'Challenger' Brachyura, p. 12.

Carapace sub-orbicular. Rostrum short, tridentate owing to the size and projection of the interantennulary septum. No pre-ocular spine; but a post-ocular spine against which the eye is retractile, but which affords no concealment to the eye. Epistome extremely narrow. Eyes large, with short eye-stalks. Basal antennal joint short, cylindrical, and perfectly free: the flagellum and part of the peduncle visible from above.

External maxillipeds with the meropodite narrow, and bearing the next joint at its summit. Chelipeds in the male long, with a long inflated club-shaped palm: in the female very short and slender. Ambulatory legs long, with remarkably thin compressed joints: some of the legs spiny.

Abdomen in both sexes with all the segments separate.

This genus appears to be very closely related to *Macrocheira*.

Platymaia wyville-thomsoni, Miers.

Platymaia wyville-thomsoni, Miers, 'Challenger' Brachyura, p. 13, pl. ii. fig. 1.

Platymaia wyville-thomsoni, Wood-Mason and Alcock, Ann. Mag. Nat. Hist., March, 1891, p. 258, and May, 1894, p. 401.

Carapace transversely sub-circular with the cervical grove well defined: its surface ranging from spinate (in the young) to nearly smooth (in old adults). The rostrum, which is so short as not to break beyond the general outline, consists of three stout spines of equal size, the middle one being the horizontally projecting interantennulary spine.

The hepatic region of the carapace bears (in the adult) a nearly vertically disposed row of three spines, against the upper one of which the eye is retractile.

The eye-stalks are short, and the eyes large and oval. The antennæ are about one-third the length of the carapace, and are plainly visible, in almost the whole of their extent, from above: the joints of the peduncle are short slender and cylindrical, the basal joint being perfectly free.

The external maxillipeds have the meropodite narrow (about half the breadth of the ischiopodite) and giving attachment to the coarse palp at the summit: both meropodite and ischiopodite are spiny.

The ,chelipeds vary considerably according to sex: in both sexes they are spiny up to the base of the fingers; but whereas in the female and young male they are much slenderer than any of the legs and are not longer than the carapace, in the adult male they are from two to three times the length of the carapace and are much stouter than any of the legs—especially as regards the palm, which is swollen and club-shaped. The 2nd to 5th pairs of legs are long and slender, with the joints thin and compressed, the propodites being blade-like. The 2nd pair, which are from 3¾ (female) to 5½ (male) times the length of the carapace, are remarkable for their propodite and dactylus, the front edge of which bears a double comb of enormous spines, the posterior edge also being spinulate: both edges of the merus and carpus also are distantly spinulate. The 3rd and 4th pairs have the front edge of the merus distantly spinulate, and they, as well as the 5th pair, have the front edge of the razor-like merus closely fringed with long stiff hairs.

The abdomen in both sexes is seven-jointed, the abdominal terga, like the thoracic sterna, bearing a few spines or tubercles. The epimeral plates corresponding to the third and fourth trunk legs are also spinate.

Andaman Sea, 130–405 fathoms.

A large male of this fine species have been figured for "Illustrations of the Zoology of the 'Investigator'" for 1896.

Note on some obvious growth-changes in Platymaia wyville-thomsoni.

In very young specimens (carapace less than half an inch in diameter) the whole carapace is closely and sharply spiny.

In larger specimens (carapace about three-quarters of an inch in diameter) the carapace has become closely and finely granular, with the spines persistent only in definite situations, somewhat as in Miers' figure and description (*loc. cit.*)

In larger specimens (carapace two and a half inches in diameter) the carapace has become coarsely and bluntly granular, without any spines, except a few quite anteriorly in the neighbourhood of the hepatic region.

In the largest specimens (carapace three to nearly four inches in diameter) the carapace is in places quite smooth, the only spines present being two external to the eye, and one on the front margin of the hepatic region.

In contrast with the carapace, the spines on the abdominal sterna of the male show no signs of effacement with age.

The colours also vary with age. In young males the carapace is red, with or without white points, and the legs are red and white in alternate bands. In the adult the colour is uniform.

ONCINOPUS, de Haan.

Oncinopus, de Haan, Fauna Japonica, Crust., p. 87.

Oncinopus, Miers, Journ. Linn. Soc., Zool., Vol. XIV. 1879, p. 645; and 'Challenger' Brachyura, p 20.

"Carapace semi-membranaceous, elongate, narrow-triangulate and depressed. Rostrum very short, composed of two vertically compressed laminiform lobes: no præ- or post-ocular spines. Post-abdomen in both sexes distinctly seven-jointed. Eyes slender and projecting laterally. Antennæ with the basal joint very short and slender, and not attaining the front, the flagella exposed and visible at the sides of the rostrum. Merus of the exterior maxillipedes elongated, and articulated with the next joint at its summit. Chelipedes in the male rather small, with the palm turgid, and the fingers having between them, when closed, an interspace at the base. Ambulatory legs slender and somewhat elongated, with the penultimate joints of the first and second pairs dilated, compressed, and ciliated on the posterior margin; the dactyli in all slightly arcuated and retractile against the penultimate joints."

Oncinopus aranea, de Haan.

Inachus (*Oncinopus*) *aranea*, de H., Faun. Japon. Crust., p. 100, pl. xxix. fig. 2.

Oncinopus aranea, Adams and White, Zool. 'Samarang,' Crust., p. 3.

Oncinopus neptunus, Adams and White, Zool. 'Samarang,' Crust., p. 1, pl. ii. fig. 1.

Oncinopus subpellucidus, Stimpson, Proc. Acad. Nat. Sci. Philad., 1857, p. 221.

Oncinopus angulatus, Haswell, Proc. Linn. Soc., N. S. Wales, IV. 1879, p. 433.

Oncinopus subpellucidus, Haswell, Cat. Austr. Crust., p. 5.

Oncinopus aranea, Miers, Zool. 'Alert,' pp. 182 and 190; and 'Challenger' Brachyura, p. 20.

Oncinopus neptunus, Walker, Journ. Linn. Soc., Zool., Vol. XX. 1890, p. 109.

Oncinopus aranea, Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 341.

Oncinopus aranea, Ortmann, Zool. Jahrb., Syst. etc., VII. 1893, p. 37.

Oncinopus neptunus, Alcock and Anderson, J. A. S. B., Pt. ii. 1894, p. 199.

Carapace elongate-triangular, thin and semi-membranous, and, as well as all the appendages, tomentose. Rostrum short, bilobed.

Eyes small, retractile beneath the edge of the carapace: no orbits or protective spines.

Antennæ extremely short, reaching only just beyond the tip of the rostrum: the basal joint short and free.

Chelipeds in the female and young male slenderer than the next legs and not quite equal in length to the carapace; in the adult male about as stout as the next legs, with an inflated almost globose palm, and a little longer than the carapace.

The 2nd and 3rd pair of legs differ very markedly from the 4th and 5th pair. The 2nd and 3rd pair are long and stout, with a comparatively short carpopodite, with a long broad propodite, and with a comparatively slightly curved dactylus—all these joints being remarkably setaceous. The 4th and 5th pair, on the other hand, are slender and comparatively short, with a long slender carpopodite and with a short propodite which with the strongly recurved dactylus forms a sub-chela—all these joints being merely tomentose. The 5th pair of legs is also remarkable for its sub-dorsal position.

Length of carapace of an adult, 14 to 15 millim.

Specimens in the Museum collection from the Laccadives, Maldives, Ceylon, Andamans and Malay Peninsula, up to 32 fms.

CAMPOSCIA, Latreille.

[*Camposcia*, Latreille, Cuvier Regne Animal (2) IV. p. 60.]
Camposcia, Milne-Edwards, Hist. Nat. Crust. I. 282.
Camposcia, de Haan, Fauna Japonica, Crust., p. 87.
Camposcia, Miers, Journ. Linn. Soc., Zool., Vol. XIV. 1879, p. 644.

Carapace pyriform. Rostrum broad, exceedingly short — hardly surpassing the level of attachment of the eyes — emarginate, slightly deflexed.

Eye-stalks long, recurved, retractile towards the sides of the carapace: a post-ocular tooth, not however affording any concealment to the eye. Antennulary fossæ coalescent to form a single chamber. Antennæ moderately long, almost entirely exposed to dorsal view, the free joints of the peduncle flattened.

External maxillipeds with the merus narrower than the ischium, and giving attachment to the next joint at the summit. Chelipeds in both sexes slender — but most so in the female — and short. Some of the ambulatory legs long.

The abdomen in both sexes has all seven joints distinct, and is as broad in the adult male as it is in the adult female — covering almost the whole sternum.

Camposcia retusa, Latr.

[*Camposcia retusa*, Latreille, Cuvier Regne Animal (2) IV. p. 60.]
[*Camposcia retusa*, Guerin, Icon. Regn. Anim. Crust., pl. ix. fig. 1.]
Camposcia retusa, Latr. Milne-Edwards, Hist. Nat. Crust. I. 283, pl. xv. figs. 15 and 16.
Camposcia retusa, Cuvier, Regne Animal, Crust., pl. xxxii. fig. 1.
Camposcia retusa, Adams and White, Zool. 'Samarang,' Crust., p. 6.
Camposcia retusa, Bleeker, Recherches Crust. de l'Ind. Archipel., p. 7.
Camposcia retusa, Stimpson, Proc. Acad. Nat. Sci. Philad., 1857, p. 218.
Camposcia retusa, A. Milne-Edwards, Nouv. Archiv. du Mus., VIII. 1872, p. 255.
Camposcia retusa, Brocchi, Ann. Sci. Nat. (6) II. 1875, Art. 2, p. 89, pl. xviii. fig. 156 (male appendages).
Camposcia retusa, Hilgendorf, Monatsber. Akad. Berl., 1878, p. 784.
Camposcia retusa, Haswell, Proc. Linn. Soc., N. S. Wales, IV. 1879, p. 433; and Cat. Austr. Stalk and Sessile-eyed Crust., p. 4.
Camposcia retusa, E. Nauck, Zeits. Wiss. Zool., xxxiv. 1880, p. 38 (gastric teeth).
Camposcia retusa, Miers, Zool. 'Alert,' pp. 181, 189, 516, and 520.
Camposcia retusa, De Man, Archiv. f. Naturgesch. LIII. 1887, Bd. i. p. 219.
Camposcia retusa, C. W. S. Aurivillius, Kongl. Sv. Vet. Akad. Handl., XXIII. 1888–89, No. 4, p. 35.
Camposcia retusa, A. Ortmann, Zool. Jahrb., Syst., etc., VII. 1893, p. 35.
[*Camposcia retusa*, F. Muller, Verh. Ges. Basel, VIII. p. 473.]

Carapace pyriform, thin, but well calcified. The whole body and most of the appendages thickly setaceous, and densely encrusted with sponges, zoophytes, algæ, etc. Rostrum broad, extremely short, somewhat deflexed, slightly emarginate.

Eye-stalks long, recurved, retractile to the sides of the carapace, and towards a slender acute post-ocular spine. Owing to the imperfection of the rostrum the interantennulary spine is not developed, so that both the antennules fold into a common chamber.

The antennæ, which are completely exposed from the base of the 2nd joint, have the basal joint long and slender, and the free joints of the peduncle flat and densely setaceous.

The hairy external maxillipeds have the antero-internal angle of the ischium produced into a long narrow lobe, parallel to the narrow meropodite.

The chelipeds in both sexes are slender and are about equal in length to the carapace: in the male they are stouter than in the female, and also differ in having the palms inflated: the fingers in both sexes are closely apposable and are toothed throughout.

The other trunk-legs increase in length from the 2nd pair (which are a little longer than the chelipeds) to the 4th pair (which are twice as long as the chelipeds): the 5th pair, again, being only as long as the 3rd pair.

The abdomen in the adults of both sexes is broad and sub-circular, almost entirely covering the sternum, and consists of seven separate segments.

In the Museum collection are adult males and egg-laden females from the Andamans, Cocos, Ceylon and Samoa—the last being from the collection of the Museum Godeffroy.

Alliance II. INACHOIDA.

INACHOIDES, Edw. & Lucas.

Inachoides, Milne-Edwards and Lucas, in D'Orbigny Voy. Amer. Merid., Crust. pp. 4 & 5.

Inachoides, Miers, Journ. Linn. Soc., Zool., Vol. XIV. p. 646.

Inachoides, A. Milne-Edwards, Miss. Sci. Mex., etc., Crust., etc., I. p. 198.

Carapace pyriform much narrowed in front, inflated behind, the regions well delimited. Rostrum simple. Eyes not, or slightly, retractile towards the sides of the carapace; never, in any position, concealed. Pre-ocular and post-ocular spines distinct—especially the latter.

Basal antennal joint long and slender: its antero-external angle visible from above, on either side of the rostrum, as an acute spine:

the rest of the antennal peduncle, and the flagellum, completely exposed from above.

Epistome broad. External maxillipeds with the merus as broad as the ischium, completely closing the mouth.

Chelipeds in the male rather longer than any of the other legs, and with a long somewhat inflated palm. Ambulatory legs of moderate length, slender, and ending in a styliform dactylus which in some cases is spinulate along the posterior border.

Abdomen of the male composed of seven distinct segments, that of the female of five.

Inachoides dolichorhynchus, Alcock & Anderson. Plate IV. figs. 1, 1*a*.

Inachoides dolichorhynchus, Alcock and Anderson: Journ. As. Soc., Bengal, Pt. ii. 1894, p. 206.

Carapace elongate-triangular. Rostrum as long as the carapace, simple, spiny, acute. The regions of the carapace are well defined, and are distantly spiny, the following spines being the most conspicuous:— (1) on each side a supra-ocular, a post-ocular (hepatic), and four branchial; (2) in the middle line, a gastric, a cardiac, and an intestinal.

The eyes, though to a certain extent retractile towards the sides of the carapace, are in all positions completely exposed.

The antennæ, which are exposed from the end of the basal joint, are long—more than three-fourths the length of the carapace: their basal joint is long, slender, flattened and fused with the neighbouring parts, and has its antero-external angle produced into an acute spine: the second and third joints are knobbed distally.

The chelipeds are long—one-fourth longer than the carapace and rostrum combined: their palm, which forms about two-fifths of their total extent and is nearly three times the length of the fingers, is broadened and moderately inflated. The 2nd pair of trunk-legs are about equal in length to the chelipeds, but the 4th and 5th pairs are not much more than half that length.

Length of carapace and rostrum 17·5 millim.; greatest breadth 8 millim.; greatest span 54 millim.

Off Madras Coast.

ENCEPHALOIDES, Wood-Mason.

Nearly related to *Inachoides*.

Carapace, owing to the remarkable inflation of the branchial regions, heart-shaped and posteriorly as broad as long (rostrum included): the branchial regions meeting across the carapace in the middle line. Rostrum simple, shaped like the beak of a bird. Eyes retractile against the sides of the carapace: a small pre-ocular and post-ocular spine, but no definite orbit.

Basal antennal joint slender throughout: the antennæ visible, dorsally, from the base of the second joint.

Merus of the external maxillipeds produced antero-externally to form a foliaceous lobe which covers the greatly produced efferent branchial orifice.

Abdomen in the male seven-jointed: in the female the fourth, fifth and sixth segments, though distinctly recognizable, are firmly fused together.

Chelipeds in both sexes slender. Legs long and slender.

Only eight branchiæ on either side.

Encephaloides armstrongi, Wood-Mason.

Encephaloides armstrongi, Wood-Mason, Ann. Mag. Nat. Hist., March, 1891 p. 259.

Carapace heartshaped: its greatest breadth is equal to its length with the rostrum: its surface in the adult is nodular or pustular, in the young coarsely spiny. The gastric and hepatic regions are well-defined; but the cardiac and intestinal regions are entirely concealed by the branchial regions, which rise up like a pair of mammæ, and meet, but without any fusion of walls, down the middle line.

The rostrum, which is shaped exactly like the beak of a bird, is about one-fourth the length of the carapace proper, and has a finely serrated edge.

In the male the abdomen is distinctly seven-jointed; but in the female the fourth, fifth and sixth segments are immovably sutured together.

The eyes which are small, slender, and unpigmented, are retractile against the side of the carapace: there is a very narrow supra-orbital eave ending anteriorly in a minute tooth, and there is a small post-ocular spinule.

On the dorsal aspect the antennæ are plainly visible on either side of the rostrum, from the base of the 2nd joint of the peduncle: the flagella, which are of hairlike tenuity, hardly surpass the tip of the rostrum.

Owing to the prolongation of the efferent branchial canal, the front edge of the buccal frame is V-shaped, and the merus of the external maxillipeds ear-shaped.

The trunk-legs recall those of *Egeria*, being all long, slender, cylindrical, and quite devoid of hairs or spines: the chelipeds are short, and are not stouter than the ambulatory legs.

For proportions, see Ann. Mag. Nat. Hist., March, 1891, p. 260.

APOCREMNUS, A. Milne-Edwards.

Apocremnus, A. Milne-Edwards, Miss. Sci. Mex., etc., Crust., etc., I. p. 184.
Apocremnus, Miers, 'Challenger' Brachyura, p. 17.

Carapace triangular or pyriform, much narrowed in front, inflated behind. Rostrum bifid. Eyes imperfectly retractile: a strong supra-ocular, but no post-ocular spine [a distant hepatic spine must not be mistaken for a post-ocular spine]. Basal antennal joint narrow, its antero-external angle forming a strong spine visible from above on either side of the rostrum: the free joints of the peduncle and the flagellum exposed to dorsal view. Epistome broad. External maxillipeds with the merus at least as broad as the ischium, quite closing the mouth-frame. Chelipeds not much enlarged: the other legs short and slender, with slender dactyli capable of some flexion on the penultimate joint. Abdomen in the male six jointed—(in the female four (?) jointed).

The genus *Apocremnus* has never yet been reported from Eastern Seas. It was first described from the Florida coast, and was afterwards reported by the 'Challenger' from Fernando Noronha (an island in the South Atlantic, off the coast of Brazil). There is nothing unprecedented therefore in its occurrence in deepish water in the Indian Ocean.

Apocremnus indicus, n. sp. Plate IV. figs. 2, 2*a*.

Carapace pyriform, inflated in the branchial, constricted in the post-ocular region, and armed with six long knob-headed spines, as follows:—one, semi-erect, above the root of either eye-stalk; one in the middle of the cardiac region, flanked on either side by one in the middle of each branchial region; one in the middle line on the posterior border. There are, in addition, on either side, two sharp spines, one above the other, near the middle of the hepatic region, and far from the eye.

The rostrum is formed of two short, slightly divergent, knob-headed spines. On either side of its base are seen the antennæ and a large spine formed by the antero-external angle of the basal antennal joint.

The constituent segments of the sternum are sharply granular, and are separated from one another by deep grooves.

The eye-stalks are of moderate length, salient, and almost immovable.

The buccal orifice is large, and the external maxillipeds are ornamented with lines of fine sharp-cut granulation: their merus is as broad as the ischium, and is excavated near the middle for the insertion of the palp. The chelipeds, in the male, are somewhat longer than the carapace and rostrum: their ischium, merus, and carpus are ornamented with lines of fine sharp granulation: the palms are elongate and compressed, with the edges carinate: the fingers, which are less than half the length of the palm, are compressed and curved.

The ambulatory legs, which decrease in length gradually, have their bases and meropodites granular, and the dactyli very slender.

The length of the carapace of the largest specimen—a male—is 9 millim., of an egg-laden female 6 millim.

From off the Andamans at about 100 fathoms, and off Ceylon at 32 to 34 fathoms.

COLLODES, Stimpson.

Collodes, Stimpson, Ann. Lyc. Nat. Hist., New York, Vol. VII. 1862, p. 193.
Collodes, Miers, Journ. Linn. Soc., Zool., Vol. XIV. 1879, p. 645.

Carapace ovate-triangular. Rostrum short, bifid, with the lobes approximate. Eyes of moderate length, retractile against a strong post-ocular process which affords no concealment. Basal antennal joint narrow, a little curved, anteriorly bidentate, one tooth placed behind the other; mobile part of the antennæ exposed. External maxillipeds with the merus as broad as the ischium, completely covering the mouth. Chelipeds of moderate size. Ambulatory legs short, prehensile, with slender dactyli which in length are equal to their propodites, and are retractile against the latter. Abdomen of the female consisting of five segments.

Collodes malabaricus, n. sp. Plate V. fig. 3.

Carapace ovate-triangular, with the gastric and cardiac regions distinct and elevated. Rostrum short, emarginate. Pre-ocular spine large and coarse, post-ocular spine very prominent. A tubercle on the cardiac region, and a large epibranchial spine on either side of it.

Basal antennal joint narrow throughout, and bearing two spines anteriorly—one at the antero-external angle, visible from above, and comparable in size to one of the rostral teeth—and one behind this, immediately in front of the base of the eye-stalk. Eyes slender and retractile towards the post-ocular tooth, which, however, affords no concealment.

Chelipeds (in the female) hardly stouter than the ambulatory legs, which are short, with prehensile dactyli.

Two ovigerous females, the larger of which is 4 millim. long, from off the Malabar Coast, 26 to 31 fathoms.

The genus *Collodes* has hitherto been known only as a tropical American genus. It has been found on both sides of Central America so that its occurrence in Indian waters is not without precedent.

Sub-family II. ACANTHONYCHINÆ.

Eyes without true orbits: eye-stalks little movable, either short and more or less concealed beneath a forwardly-directed supra-ocular spine, or obsolescent and almost or completely sunk either in the sides of a huge beak-like rostrum, or between low pre-ocular and post-ocular excrescences (*Sphenocarcinus*): a distinct post-ocular spine, which is not cupped, may be present (*Pugettia*). Basal antennal joint truncate-triangular.

External maxillipeds with the merus as broad as the ischium, and with the (small) palp arising from the antero-internal angle of the merus.

Dactyli of the ambulatory legs prehensile or sub-chelate, in the former case the last three pairs of legs are often disproportionately short compared with the second pair. Rostrum either simple or two-spined.

Key to the Indian genera.

I. Rostrum of huge size; simple, or bifid at tip; not flanked on either side by salient supra-ocular spines.	1. Eye-stalks almost obsolete, completely sunk, and almost or quite immovable: carapace smooth or tuberculate: no post-ocular process.	i. Carapace and rostrum sub-cylindrical, the latter bifid at tip..........	XENOCARCINUS.
		ii. Carapace depressed, elongate-triangular: rostrum laterally compressed, not bifid at tip.........	SIMOCARCINUS.
	2. Eye-stalks short, sunken but movable between low smooth pre-ocular and post-ocular excrescences: carapace with huge symmetrical pedicled tablets........		SPHENOCARCINUS.

- II. Rostrum flanked on either side by salient supra-ocular spines; either long and simple, or consisting of two spines of moderate length: no post-ocular process.
  - 1. Carapace elongate-triangular, rostrum elongate, simple: ambulatory legs not subchelate.
    - i. Rostrum laterally compressed, supra-ocular spines small: eye-stalks so short and deeply sunken as to hardly reach to the sides of the carapace; carapace of the female with large foliaceous lateral lobes........ HUENIA.
    - ii. Rostrum horizontally compressed, supra-ocular spines large: eye-stalks short, but reaching beyond the sides of the carapace: carapace of the female without foliaceous lobes................ MENÆTHIUS.
  - 2. Carapace broad, sub-quadrangular: rostrum short and deeply bifid, ambulatory legs subchelate.............................. ACANTHONYX.

XENOCARCINUS, White.

Xenocarcinus, White, Jukes' Voyage H. M. S. 'Fly,' Vol. II. p. 335.

Huenioides, A. Milne-Edwards, Ann. Soc. Entomol. France (4) V. 1865, p. 144.

Xenocarcinus, Miers, Journ. Linn. Soc., Zool., Vol. XIV. 1879, p. 648, pl. xii. fig. 5.

Carapace ovate-subcylindrical, tapering to a long thick subcylindrical rostrum, or beak, the tip of which is emarginate or bifid.

Eyes short, completely sunken in the sides of the rostrum, almost immovable: no præ-ocular or post-ocular spines.

Antennæ with the basal joint triangular, and with the short mobile portion hidden beneath the rostrum.

External maxillipeds with the merus as broad as the ischium and giving attachment to the palp at its antero-internal angle.

Chelipeds not much shorter or stouter than the 2nd and 3rd pairs of legs: 4th and 5th pairs of legs short: all with the dactyli short, stout, curved, and sharply toothed along the posterior surface.

Abdomen of the female four-jointed, the 3rd—6th segments being fused together.

Xenocarcinus tuberculatus, White.

Xenocarcinus tuberculatus, White, P. Z. S., 1847, p. 119, and Ann. Mag. Nat. Hist. (2) I., 1848, p. 221, and in Jukes' Voyage H. M. S. 'Fly,' Vol. II. p. 336.

Xenocarcinus tuberculatus, Hess, Archiv. f. Naturges. XXXI. i. 1865, pp. 131 and 171.

Xenocarcinus tuberculatus, A. Milne-Edwards, Nouv. Archiv. du Mus. VIII. 1872, p. 253, pl. xii. fig. 1.

Xenocarcinus tuberculatus, Miers, Zool. 'Erebus' and 'Terror,' Crust., p. 1, pl. ii. fig. 1, 1c.

Xenocarcinus tuberculatus, Haswell, P. L. S., N. S. Wales, Vol. IV. 1879, p. 436, and Cat. Austr. Crust., p. 8.

Xenocarcinus tuberculatus, Ortmann, Zool. Jahrb. Syst., etc., VII. 1893, p. 40.

Carapace elongate ovate-subcylindrical with the regions ill defined and the surface more or less tuberculated. [Typically the tubercles fall into distinct transverse rows]. The rostrum has the form of a long coarse cylindrical beak, the apex of which is bifid, and the surface densely covered with velvety hairs.

The eyes are completely and almost immovably sunk in the sides of the rostrum.

The antennary flagella are much shorter than, and are completely hidden by, the rostrum.

The chelipeds and ambulatory legs are short and nodular, the latter having curved strongly-toothed prehensile dactyli. The chelipeds are hardly stouter, and are not much shorter, than the 2nd pair of legs, which again are much longer than the 3rd to 5th pair. The colours described by White are "two or three waved longitudinal red lines on the posterior half of the carapace, the inner line continued before the eyes." By A. Milne-Edwards the colours of the carapace and legs are said to be reddish stained with yellow.

In a good spirit specimen the abdomen carapace and beak are dull reddish brown, with a broad yellow stripe extending from the base of the beak to the tip of the abdomen, and on either side of the carapace a narrow sinuous yellow line; and the trunk-legs are yellow, more or less banded and striped with dull brown.

In the Museum collection are two females, one from Ceylon (34 fathoms), the other from the Andamans. The one from Ceylon, which is an egg-laden adult 15 millim. long, resembles as to its carapace and rostrum, but not as to its legs, the figure in the Zoology of the 'Erebus' and 'Terror;' and as to its legs, but not as to its carapace and rostrum, the figure in Archiv. du Mus. tom. VIII. 1872. The other, from the Andamans, which is not adult, exactly resembles, as to its carapace, but not as to its legs, the last cited figure.

SPHENOCARCINUS, A. Milne-Edwards.

Sphenocarcinus, A. Milne-Edwards, Miss. Sci. Mex., Crust., I., p. 135.

Sphenocarcinus, Miers, Journ. Linn. Soc., Zool., Vol. XIV. 1879, p. 663; and 'Challenger' Brachyura, p. 34.

Carapace elongate sub-pentagonal, broad behind, tapering in front to a long rostrum formed of two spines (fused together to near the tip). The surface of the carapace is symmetrically and deeply honey-combed by broad deep channels which leave symmetrical tubercles with overhanging edges between them.

There are no true pre-ocular and post-ocular spines, but the eye is deeply sunk between two low smooth excrescences which are pre-ocular and post-ocular in position.

The basal antennal joint is truncate-triangular, and the antennary flagella are completely hidden beneath the rostrum. The epistome is long and narrow. The external maxillipeds have the merus as broad as the ischium, somewhat dilated at the antero-external angle, and somewhat excavated at the antero-internal angle for the insertion of the small palp. The chelipeds are not much stouter, and not much shorter than the next pair of legs, which are the longest: the dactyli of the legs, though stout recurved and prehensile, are not toothed along the posterior edge. Abdomen, in both sexes, seven-jointed.

Oxypleurodon Miers ('Challenger' Brachyura, p. 38) differs from *Sphenocarcinus* only in the form of the rostrum, the spines of which are divergent instead of convergent and more or less fused. I much suspect the generic value of this character. If, however, the two forms be identical, then *Sphenocarcinus* would have to be removed to the next sub-family, in which case the sub-family Acanthonychinæ would be perfectly homogeneous.

Sphenocarcinus cuneus (Wood-Mason).

Oxypleurodon cuneus, Wood-Mason, Ann. Mag. Nat. Hist., (6) VII. 1891, p. 261.

Carapace elongate sub-pentagonal, narrowing to a long tapering cylindrical rostrum, which, in the male, is longer than the carapace and only emarginate at the extreme tip, but, in the female, is shorter than the carapace and distinctly bifid at the end.

The carapace is symmetrically honey-combed by deep channels, which leave between them great symmetrically undermined islets, as follows:—one, very elongate-oval, on the gastric region; one, triangular, on the cardiac region; one, somewhat semilunar with one horn much produced laterally, on each branchial region; and one, Cupid's bow-shaped, along the posterior border. Besides these there are some smaller islet-like excrescences, namely, on each side, a supra-ocular, post-ocular, hepatic, and branchial.

Between the supra and post-ocular excrescences, are set the small squat little-movable eyes.

Of the trunk-legs, the 2nd pair (*i.e.*, first ambulatory legs) are the longest, being very slightly longer than the chelipeds, and considerably shorter than the carapace measured with the rostrum, but much longer than any of the last 3 pairs of legs.

In the female all the long joints, except the dactyli, and in the male all except the dactyli and propodites, are strongly carinated dorsally.

The chelipeds are hardly stouter than the next pair of legs, except as regards the palm in the male, which is broadened and somewhat inflated. In neither sex are the short white polished fingers apposable throughout.

	Male.	Female.
Length of carapace and rostrum ...	19· millim. ...	18·5 millim.
Greatest breadth of carapace ...	12· " ...	13· "
Length of rostrum alone ...	10·5 " ...	8·7 "
" of 2nd pair of trunk-legs ...	15·5 " ...	15· "

Loc. Andaman Sea, 161 to 250 fathoms.

This extremely elegant species has been figured for next year's issue of "Illustrations of the Zoology of the 'Investigator.'"

HUENIA, de Haan.

Huenia, de Haan, Faun. Japon. Crust., p. 83

Huenia, Miers, Journ. Linn. Soc., Zool., Vol. XIV. 1879, p. 648; and 'Challenger' Brachyura, p. 34.

Carapace depressed, elongate-triangular in the male,* with the lateral epibranchial angles produced; sub-quadrangular in the female, with two large foliaceous lobes (epibranchial and hepatic) on either side: a small pre-ocular, but no post-ocular spine. Rostrum simple, acute, vertically deep, laterally compressed. Abdomen in the male seven-jointed; in the female five-jointed; with the fourth to the sixth joints coalescent.

Eyes very small and almost immobile.

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* A small hepatic lobe is sometimes present in the male also, on either side.

Basal antennal joint somewhat enlarged, and coalescent at its distal extremity with the front; beneath which the flagella are inserted out of sight in a dorsal view.

The external maxillipeds are small, the merus distally truncated, and bearing the palp at its antero-internal angle. Chelipeds in the male moderately developed, with the palms compressed and cristate above, the fingers somewhat excavated at the tips, and not apposable throughout their extent. Ambulatory legs short—the longest pair not much longer than the chelipeds, dactyli short, stout, strongly recurved, and more or less toothed along the posterior margin.

Huenia proteus, de Haan.

Maja (Huenia) proteus, de Haan, Faun. Japon. Crust., p. 95, pl. xxiii. figs. 4–6.

Huenia proteus, Adams and White, 'Samarang' Crustacea, p. 21, pl. iv. figs. 4–7, and p. 22, pl. iv. fig. 5.

Huenia proteus, Haswell, Proc. L. S., N. S. Wales, Vol. IV. 1879, p. 437; and Cat. Austr. Crust., p. 9.

Huenia proteus, Miers, Zool. 'Alert,' pp. 182 and 191, and 'Challenger' Brachyura, p. 35.

Huenia proteus, C. W. S. Aurivillius, Kongl. Svensk. Vet. Akad. Handl. XXIII. 1888-89, No. 4, p. 40, pl. iii. fig. 3.

Huenia proteus, R. I. Pocock, Ann. Mag. Nat. Hist. (6) V. 1890, p. 79.

Huenia proteus, Henderson, Trans. Linn. Soc., Zool. (2) V. 1893, p. 341

Huenia proteus, Ortmann, Zool. Jahrb., Syst., etc., VII. 1893, p. 40.

Carapace flat, depressed, with two low elevations in the middle line, otherwise smooth: in the male the carapace is elongate triangular, with the lateral epibranchial angles produced to form small lobes, and sometimes with the hepatic regions expanded in the same way: in the female the carapace is quadrilobate, owing to the foliaceous extension of the hepatic and epibranchial angles. Rostrum long, simple, acute, deep, and laterally compressed. Supra-ocular spines small. Eyes small, deeply sunk beneath the pre-ocular spine, almost immovable.

In the male the chelipeds are somewhat shorter, and the next pair of legs (which are the longest) are somewhat longer than the carapace and rostrum combined: in the female the chelipeds are considerably shorter than, and the next pair of legs are about the same length as, the carapace and rostrum. In the female and young male the fingers, which are closely toothed, meet throughout the greater part of their extent: in the male they meet only at the tips.

The last three pairs of legs are very short. All the long joints, except the dactyli, of all the trunk-legs are more or less carinate dorsally (anteriorly), the carination often being more or less discontinuous in the case of the chelipeds: the dactyli of the ambulatory legs are stout, strongly recurved, and more or less toothed along the posterior margin.

In the Museum collection there are several females, but only two males, from various parts of the Andamans, up to 20 fathoms.

SIMOCARCINUS, Miers.

Simocarcinus, Miers, Journ. Linn. Soc., Zool., Vol. XIV. 1879, p. 649.

As *Huenia*, but without the supra-ocular spine; with the chelipeds much stouter, especially as to the palm, which is much inflated; and with the ambulatory legs more cylindrical.

Simocarcinus pyramidatus (Heller).

Huenia pyramidata, Heller, Crust. Roth. Meer., in SB. Akad. Wien XLIII. 1861 p. 307, pl. i. fig. 9.

Description of the Male.

Carapace elongate-triangular, narrowing to a huge, deep, laterally compressed rostrum of greater length than the carapace: the hepatic regions are marked by a faint bulge, and the lateral epibranchial angles are very sharp cut, while the limits of the posterior border are bounded on either side by a small lobule. Except for a somewhat elongate eminence on the gastric region and a tubercle on the posterior cardiac region, the carapace is perfectly smooth.

The eyes are deeply sunk, and nearly immobile, and the cornea is somewhat deficient in pigment.

The chelipeds, which are markedly stouter than the other legs, are a little shorter than the carapace and rostrum; and the next pair of legs, which are a good deal more than twice the length of the 3rd pair and than thrice the length of the 5th pair, are equal in length to the carapace and rostrum. The palms are broadly inflated; and the fingers, which are strongly arched, meet only at the tips.

The ambulatory legs are cylindrical, and their dactyli are stout, strongly recurved, and toothed along the posterior margin.

Our single perfect specimen—a male from the Nicobars—measures 30 millim. in length of carapace and rostrum.

Simocarcinus simplex (Dana).

Huenia simplex and *brevirostrata*, Dana, U. S. Expl. Exp. Crust. I. pp. 133 and 134, pl. vi. figs. 3*a–c*, 4*a–c*.

Simocarcinus simplex, Miers, Jour. Linn. Soc., Zool., Vol. XIV. 1879, p. 649; and 'Challenger' Brachyura, p. 35 (*ubi synon.*).

[*Simocarcinus simplex*, Cano, Boll. Soc. Nat. Napol. III. 1889, p. 173.]

Simocarcinus simplex, J. R. Henderson, Tr. Linn. Soc. Zool. (2) V. 1893, p. 342.

This species is distinguished from *Simocarcinus pyramidatus* (Hell.) (1) by the much shorter rostrum of the male; (2) by the presence of three tubercles, disposed in a triangle, on the gastric region; (3) by the larger and more prominent eyes; (4) by the absence of the lobule on either side of the posterior border of the carapace; (5) by the much more massive chelipeds of the male.

This species is included in the Indian Fauna on the authority of Prof. J. R. Henderson. There are no specimens in the Indian Museum.

MENÆTHIUS, Edw.

Menæthius, Milne-Edwards, Hist. Nat. Crust. I. 338.

Menæthius, Miers, Journ. Linn. Soc., Zool., Vol. XIV. 1879, p. 649; and 'Challenger' Brachyura, p. 36.

Carapace subpyriform, moderately convex, and tuberculated on the dorsal surface, with a large triangulate præ-ocular spine, but no post-ocular spine. Rostrum simple, slender, acute, or emarginate at apex. Post-abdomen in the male seven-jointed, in the female usually five-jointed, the penultimate joint formed by the coalescence of three segments. Eyes small, mobile, but not perfectly retractile. Basal antennal joint slightly wider at the base than at the distal extremity, which is unarmed; flagellum exposed and visible from above at the side of the rostrum. Merus of the exterior maxillipedes truncated at the distal extremity and with a prominent antero-external angle, and slightly notched at the antero-internal angle where it is articulated with the next joint. Chelipedes (in the male) well developed, with the palm slightly compressed; fingers acute, and having between them, when closed, an interspace at the base. Ambulatory legs of moderate length; the joints subcylindrical, not dilated or compressed; dactyli slightly curved and partially retractile. (Miers).

Menæthius monoceros, (Latr.) Edw.

[*Pisa monoceros*, Latr., Encycl. X. 139.]

Inachus arabicus, Rüppell, Krab. Roth. Meer., p. 24, pl. v. fig. 4.

Menæthius monoceros, Milne-Edwards, Hist. Nat. Crust., Vol. I. p. 339.

Menæthius subserratus, *porcellus*, and *tuberculatus*, Adams and White, 'Samarang' Crustacea, pp. 18 and 19, pl. iv. figs. 1 and 2.

Menæthius angustus, *depressus*, *subserratus*, *tuberculatus*, *areolatus* and *inornatus*, Dana, U. S. Expl. Exped., Crust. I. pp. 121–125, pl. iv. figs 5*a*–7*g*, and pl. v. figs. 1*a*–3*d*.

Menæthius subserratus, *dentatus* and *depressus*, Stimpson, Proc. Ac. Nat. Sci. Philad., 1857, p. 219.

Menæthius monoceros, Heller, Crust. Roth. Meer, SB. AK. Wien, XLIII. 1861, p. 306.

Menæthius monoceros, A. Milne-Edwards in Maillard's L'ile Réunion, Annexe F, p. 6; and *rugosus* p. 7, pl. xvii. fig. 2.

MENÆTHIUS MONOCEROS, A. MILNE-EDWARDS, NOUVELLES ARCHIVES DU MUSEUM IV. 1868, p. 70, and VIII. 1872, PP. 252 and 253 (UBI. SYNON.)

Menæthius monoceros, Miers, Phil. Trans. Vol. 168, 1879, p. 485, and Zoology 'Alert,' pp. 182, 190, 517 and 521, and 'Challenger' Brachyura, p. 37.

Menæthius monoceros, Haswell, P. L. S., N. S. Wales, Vol. IV. 1879, p. 437, and Cat. Austr. Crust., p. 9.

Menæthius monoceros, de Man, Notes Leyden Mus. II. 1880, p. 171, and Archiv. f. Naturges. LIII. 1887, i. 219.

Menæthius monoceros, Richters in Möbius Meeresf. Mauritius, p. 145.

[*Menæthius monoceros*, Cano. Boll. Soc. Nat. Napol. III. 1889, p. 175.]

Menæthius monoceros, Henderson, Trans. Linn. Soc. Zool. (2) V. 1893, p. 342.

Menæthius monoceros, Ortmann, Zool. Jahrb. Syst., etc., VII. 1893, p. 41.

Carapace elongate-triangular, most markedly so in the male, the lateral epibranchial angles sharp-cut, and the surface very variably tuberculated.

The rostrum, which is flanked on either side by the forwardly-directed supra-ocular spine, is styliform, acute, and horizontally compressed, its length being about half that of the carapace in the male, but a good deal less in the female.

The small eyes are imperfectly retractile, and project freely from beneath the supra-ocular spine.

The chelipeds in the male are as long as, or a little longer than, the 2nd pair of legs, or about equal in length to the carapace and rostrum: they are very much stouter than any of the other legs, and have a somewhat inflated palm, and fingers which meet only at the tips.

The chelipeds in the female are not stouter than the other legs, and are considerably shorter than the next pair of legs, which, again, are a good deal shorter than the carapace and rostrum: the fingers meet through the greater part of their extent.

The 3rd–5th pair of legs are very much shorter than the 2nd pair: in all the dactyli are strongly recurved and are toothed along the posterior margin.

Very numerous specimens from the Andamans and Nicobars.

ACANTHONYX, Latr.

[*Acanthonyx*, Latreille, Regne Animal, (2) IV. 58.]

Acanthonyx, Milne-Edwards, Hist. Nat. Crust. I. 342.

Acanthonyx, A. Milne-Edwards, Miss. Sci. Mex., Crust. I. 142.

Acanthonyx, Miers, Journ. Linn. Soc., Zool., Vol. XIV. 1879, p. 650; and 'Challenger' Brachyura, p. 42.

Carapace sub-oblong, rounded behind, and with the dorsal surface usually depressed, not markedly constricted behind the prominent antero-lateral angles, the lateral branchial spines small and not prominent. Præ-ocular spine prominent, acute. Spines of the rostrum united at the base, acute and but little divergent. Post-abdomen in the male six-jointed. Eyes small, mobile, but not completely retractile. Basal antennal joint narrowing slightly from the base to the distal extremity, which is unarmed; flagellum exposed and visible from above at the side of the rostrum. Merus of the exterior maxillipeds truncated at the distal extremity and but slightly notched at the antero-internal angle, where it is articulated with the next joint. Chelipeds (in the adult male) well developed; palm compressed, but slightly turgid in the middle, and often slightly carinated above; fingers acute, and having between them, when closed, an interspace at the base. Ambulatory legs short, with the penultimate joints more or less dilated and compressed and armed with a tooth or lobe on its inferior margin, against which the small acute dactylus closes. (Miers).

Acanthonyx macleayi, Krauss.

Acanthonyx macleayi, Krauss, Sudafrikan. Crust., p. 47, pl. iii. fig. 6.
Acanthonyx macleayi, Miers, 'Challenger' Brachyura, p. 43.

Carapace sub-quadrangular, with the hepatic and lateral branchial spines well developed: these spines, as well as the spines of the rostrum and the carapace immediately behind the rostrum, are tufted with setæ; and on the gastric region in a line with the hepatic spines are two elevated tufts of setæ. Except for the spines and elevations above-mentioned, and for a slight median elevation in its posterior half, the carapace, both as to its margins and as to its surface, is perfectly smooth and unarmed.

The supra-ocular spines are parallel with, and in the female almost comparable in size with the rostral spines.

The chelipeds in the male, but not in the female, are much stouter than any of the other legs: in the male they are nearly as long as the carapace, and have the carpus and palms much inflated, and the fingers in contact only at their tips: in the female they are only about two-thirds the length of the carapace, and have the joints slender, and the fingers closely apposable throughout.

The other legs, which are subchelate, are not disproportionately short compared with the chelipeds: the last pair is sub-dorsal in position.

In the Museum collection are specimens from Karáchi.

Acanthonyx consobrinus, A. Milne-Edwards.

Acanthonyx consobrinus, A. Milne-Edwards, in Maillard's l'Ile de la Réunion, Annexe F. p. 7, pl. xvii. figs. 3, 3*b*.
Acanthonyx consobrinus, Heller, 'Novara' Crustacea, p. 5.

"Carapace broadened, and a little swollen, surface non-granular. Gastric region with three ill-defined tubercles. Cardiac region either smooth or with sometimes a trace of a rudimentary tubercle. Lateroanterior border cut into four or five teeth, of which the first, or external orbital angle, is small and pointed, the second larger *et à extrémité mousse*, and the others successively smaller. The rostrum consists of two short stout spines, and the supra-ocular border forms a spine. Chelipeds short: fingers evenly toothed. Ambulatory legs ending in a recurved claw. The abdomen of the male consists of 5 segments, the 2nd, 3rd and 4th being fused together.

There are no specimens of this species in the Museum Collection, which is included in this Fauna on the authority of Dr. Heller who mentions it in the 'Novara' Collection, from Madras.

The genus or sub-genus *Scyramathia* has, I think, very close affinities with the genus *Pugettia*, and is certainly, I think, a close link between this sub-family and the following.

Sub-family iii. PISINÆ.

Eyes with commencing orbits, of which one of the most characteristic parts is a large, blunt, usually isolated and cupped post-ocular tooth or lobe, into which the eye is retractile, but never to such an extent as to completely conceal the cornea from dorsal view: there is also almost always a prominent supra-ocular eave, the anterior angle of which is sometimes produced forwards as a spine. Eye-stalks short. Basal antennal joint broad, at any rate at the base; its anterior angle generally produced to form a tooth or spine. Merus of the external maxillipeds, owing to the expansion of its antero-external angle, broader than the ischium, and carrying the palp at its antero-internal angle. Rostrum two-spined (in *Doclea* obscurely so). Legs often very long.

Key to the Indian Genera.

Alliance 1. PISOIDA. Supra-ocular eave not in close contact with the post-ocular spine or process, and generally produced, but not very conspicuously, at the antero-external angle in the plane of the rostrum.

- I. Spines of the rostrum separate from the base, usually long and divergent.
  - 1. Post-ocular tooth either not cupped, or if cupped then the carapace is armed with long acute spines of uniformly large size and regular arrangement ...... SCYRAMATHIA.
  - 2. Post-ocular tooth deeply cupped; spines of the carapace, if present, never of uniform size and arrangement.
    - i. Spines of the rostrum bearing a secondary spinule, either at tip or somewhere in their distal half .... NAXIA.
    - ii. Spines of the rostrum without a secondary spinule HYASTENUS.

- II. Spines of the rostrum coalescent in their basal half.
  - 1. Carapace sub-circular or globular: rostrum emarginate: ambulatory legs of moderate length, stout: the entire body, and the appendages in great part, densely tomentose .... DOCLEA.
  - 2. Carapace broadly triangular: tip of the rostrum deeply cleft: ambulatory legs extremely long and slender.
    - i. Post-ocular lobe completely isolated both from the supra-ocular eave and from the basal antennal joint: 2nd pair of trunk-legs never approaching six times the length of the carapace... CHORILIBINIA.
    - ii. Space between the post-ocular lobe and the supra-ocular eave, as well as that between the post-ocular lobe and the basal antennal joint occupied by a spine: 2nd pair of trunk-legs six or more times the length of the carapace.......... EGERIA.

Alliance 2. LISSOIDA. Supra-ocular eave in the closest contact with the post-ocular process, and with its antero-external angle almost always (always in Indian genera) very strongly produced forwards in the plane of the rostrum.

- i. Surface of carapace tubercular: chelipeds of the male stouter than those of the female: abdomen of the female seven-jointed........ TYLOCARCINUS.
- ii. Surface of carapace spiny: chelipeds of the male not stouter than those of the female: abdomen of the female five-jointed........ HOPLOPHRYS.

Alliance I. PISOIDA.

SCYRAMATHIA, A. Milne-Edwards.

Scyramathia, A. Milne-Edwards, Compt. Rend. XCI. 1881, p. 356.
Scyramathia, Sars, Norwegian North-Atlantic Expedn., Crustacea I^A. p. 5.
Scyramathia, S. I. Smith, 'Albatross' Crustacea (1884), 1886, p. 21.
Anamathia (part) Miers, 'Challenger' Brachyura, p. 25.

Carapace pyriform or elongate-triangular, armed either with tubercles, or with long spines much like those of *Anamathia* in their uniform size and definite arrangement: the hepatic and lateral epibranchial spines are always prominent and very conspicuous. The rostrum consists of two spines, which are usually long and slender. The eyes are small, and are retractile against a sharp post-ocular process which commonly is but little cupped : there is also a supra-ocular eave which terminates either in a forwardly directed tooth or in an upturned spine. Basal antennal joint not very broad, sharply truncated : the mobile portion of the antennæ freely exposed on either side of the rostrum.

Merus of the external maxillipeds as broad as the ischium, slightly expanded at the antero-external angle, and bearing the palp at the antero-internal angle.

Chelipeds in the adult male (but not in the female and young male) enlarged, with the palms broadened and compressed.

First pair of ambulatory legs markedly the longest.

The abdomen in both sexes consists of seven distinct segments.

There is certainly a close superficial resemblance between this genus and *Anamathia ;* but I quite agree with Prof. Sars that the two forms are not very closely united. Prof. Sars thinks that *Scyramathia* is nearest to *Hyastenus*, an opinion with which I concur, although I also think that there are quite as close relations to *Pugettia*.

Scyramathia pulchra, Miers.

Anamathia pulchra, Miers, 'Challenger' Brachyura, p. 26, pl. iv. fig. 1 (adult male).

Anamathia livermorii, Wood-Mason, Ann. Mag. Nat. Hist. March 1891, p. 260 (young male and adult female).

Body and limbs everywhere closely covered with short hairs, which on the carapace are peg-shaped ; and with numerous long scattered setæ. The carapace, which is subpyriform, is armed with twenty long sharp spines disposed in five longitudinal series. Of these spines five are on the gastric region, one is on the cardiac, and one on the intestinal region, one stands above either eye, one on each hepatic, and four on each branchial region : in addition there is a distinctly cupped post-ocular lobe.

The rostrum consists of two slender divergent spines, the length of which is more than half that of the carapace.

The eyes are small, and the cornea, though retractile against the post-ocular lobe, can never be concealed.

The basal antennal joint is broad, and has its antero-external angle somewhat produced : the mobile portion of the antenna is completely exposed to dorsal view.

The external maxillipeds have the ischium and merus somewhat concave.

The chelipeds vary according to sex. In the adult male they are longer than the carapace and rostrum, and are far stouter than any of the other legs: the carpus is enlarged and sculptured, the palm is broadened, as well as somewhat carinate along both edges and strongly produced at the postero-inferior angle, and the fingers are opposable in their distal half only: in the female and young male they are shorter than the carapace with the rostrum, and are hardly stouter than the other legs; all the joints are subcylindrical, and the fingers are apposable in the greater part of their extent.

In both sexes, the merus of all the legs, including the chelipeds, has a spine or tooth at the far end of its upper margin. The 2nd pair of trunk-legs, which are the longest, are, in the male, nearly twice the length of the carapace and rostrum, but in the female are considerably shorter.

Loc. Andaman Sea, 130 to 561 fathoms.

Scyramathia rivers-andersoni, n. sp.

Carapace closely covered with peg-shaped hairs with long setæ interspersed: legs with few setæ. The carapace, which is pyriform and somewhat inflated, has, besides a supra-ocular tooth and a sharp post-ocular process, and besides a salient hepatic spine, and a still more salient lateral epibranchial spine (about two-fifths the greatest breadth of the carapace in length) six sharply conical tubercles evenly and equidistantly arranged in a circle round a central caradiac tubercle: of these the most posterior overhangs the middle of the posterior border, while the most anterior, which is situated far back on the gastric region, is flanked on either side by a very faint eminence.

The rostrum consists of two slender divergent horns, the length of which in the male is about three-quarters, in the female about two-thirds, that of the rest of the carapace.

The eyes are small, and though freely movable forwards are not retractile backwards further than to impinge against the summit of the post-ocular process of the carapace. The basal antennal joint, which is of no great width, is sharply truncated: the mobile portion of the antenna is freely exposed on either side of the rostrum.

The chelipeds in the fully adult male (but not in the young male) are much stouter than the other legs, and are as long as the carapace and rostrum; their merus is prismatic with knife-like edges, the upper edge ending in a spine; their carpus is bicarinate, the outer carina being very prominent; the hands, which form nearly half their total length, have the palm carinate along the upper edge, and the fingers slightly separated when closed.

In the female the chelipeds are not stouter than the other legs, are not much longer than the carapace proper, and have the fingers closely apposable throughout.

Of the ambulatory legs the first are much the longest, being nearly half again as long as the carapace and rostrum; while the last two pairs are very short and have their dactyli reduced in length, increased in strength, and strongly recurved.

	Male.	Female.
Length of carapace and rostrum...	21 millim.	16·5 millim.
" rostrum	9 "	7 "
" chelipeds	21 "	11 "
" 2nd pair of trunk-legs...	31 "	20 "
" 5th	15 "	11 "

Loc. Off Malabar coast, 406 fms.

Scyramathia beauchampi (Alcock and Anderson).

Anamathia beauchampi, Alcock and Anderson, J. A. S. B., 1894, Pt. ii. p. 185.

Body and legs downy, and with numerous large coarse curly clavate hairs, which are very regularly arranged on the legs, where also they are coarsest and closest. Carapace sub-triangular, with the following armature:—

On either hepatic region a great up-curved earlike spine (without any bullous base). On either branchial region, posteriorly, a strong up-turned spine; and anteriorly, near the middle line, a smaller coarse tooth. On the gastric region four sharpish tubercles. On the narrow sunken cardiac region a coarse sharp tooth. On the posterior border, in the middle line, a coarse granule.

The rostrum consists of two more (♀) or less (♂) divergent spines, the length of which is about one-third that of the rest of the carapace.

The eyes are small, and are almost devoid of pigment: they are to some extent hidden beneath a pre-ocular tooth of moderate dimensions, and are retractile against a larger laterally-compressed post-ocular plate.

The antennæ are completely exposed, from the base of the second joint of the peduncle.

The chelipeds in the male are massive, and in length are more than half again as long as the carapace and rostrum: all their joints, from the ischium to the propodite, have one or more of their edges conspicuously and sharply cristiform, this being specially well marked in the case of the long trigonal meropodite, which has all its edges sharply phalanged, and in the case of the equally long slightly inflated palm, which has razor-like edges. The fingers, which are not nearly half the length of the palm, are acute, and have their cutting edges entire.

The 2nd–5th pairs of legs are slender, with cylindrical joints, the 2nd are nearly or quite equal in length to the chelipeds, the 3rd–5th decrease gradually in size.

In an adult female, equal in size to the male above described, the chelipeds are shorter than the 2nd pair of legs, and are similar in general proportions to the other legs.

Colours in life: "Earth-colour with the chelipeds pink."

	Male.	Female (adult.)
Length of carapace (including rostrum)...	18 millim. ...	15·5 millim.
Greatest breadth of carapace ...	12·5 „ ...	11·5 „
Length of cheliped	29 „ ...	14 „
Greatest breadth of palm	4·5 „ ...	1 „

Loc. Bay of Bengal, 193 and 210 fathoms.

The ova are large (diam. 1 millim.) and rather few in number.

In young males the chelipeds are of proportions intermediate between those of the adult male and female.

Scyramathia globulifera, Wood-Mason.

Pugettia globulifera, Wood-Mason, Ann. Mag. Nat. Hist. March, 1891, p. 260.

Distinguished by the vertically erect ear-like hepatic spine, the base of which forms a great polished bulla on either side of the buccal frame, giving the animal, when viewed front end on, a bat-like appearance.

The body and legs are downy, the legs being fringed with short broad curly hairs.

The carapace, in which the cardiac region is broad and prominent and not, as in *S. beauchampi*, narrow and sunken, has, besides the hepatic spine already mentioned, the following marks:—

On the branchial regions, below and anteriorly, a sharp sinuous human-ear-shaped crest; above and posteriorly a spine; and near the middle line anteriorly an acumination. On the gastric region four faint elevations. On the cardiac region, and also on the intestinal region, in the middle line, an acuminate eminence.

The rostrum consists of two divergent spines, about one-third the length of the rest of the carapace.

The eyes stand well out from beneath the pre-ocular spine, and are retractile against a small post-ocular tooth.

The other appendages closely resemble those of the preceding species; but the chelipeds, in the adult male, are shorter, being only equal in length to the carapace and rostrum, and the fingers have their cutting edges crenulate instead of smooth.

In females and in young males the chelipeds have the same relative proportions as in *Scyramathia beauchampi*.

	Male.	Female (adult).
Length of carapace (including rostrum)...	17 millim....	13 millim.
Greatest breadth of carapace... ...	10 " ...	7·5 "
Length of cheliped	18 " ...	9·5 "
Greatest breadth of palm	4 " ...	1·2 "

Loc. Andaman Sea, 130–240 fathoms.

Miers *Pugettia velutina* ('Challenger' Brachyura, p. 41, pl. vi. figs. 2, 2*a*, 2*b*) should, I think, be placed in this sub-genus—*Scyramathia.*

HYASTENUS, White.

Hyastenus, White, P. Z. S., 1847, p. 56.

Hyastenus, Miers, Journ. Linn. Soc., Zool., Vol. XIV. 1879, p. 658 (*et synon.*); and 'Challenger' Brachyura, p. 55.

Chorilia and *Lahainia*, Dana, U. S. Expl. Exp. Crust. I. pp. 91 and 92.

Carapace subpyriform, convex, either smooth or tuberculate, sometimes spiny. Supra-ocular eave very prominent, usually somewhat acuminately produced anteriorly: post-ocular spine, or lobe, large and excavated. The rostrum consists of two usually long slender divergent spines. Eye-stalks short, retractile against the post-ocular lobe, but never to the complete concealment of the cornea.

Basal antennal joint broad, its antero-external angle sometimes produced: the mobile portion of the antenna usually exposed to dorsal view.

Merus of the external maxillipeds as broad as, or broader than, the ischium, expanded at the antero-external angle, and bearing the palp at the antero-internal angle.

Chelipeds in the adult male enlarged: the second pair of trunk-legs usually very much longer than the 3rd 4th and 5th pairs.

The abdomen in both sexes consists of seven distinct segments.

Key to the Indian species of Hyastenus.

- I. Denuded carapace with numerous tubercles, or spines, and erosions.
  - 1. Rostral spines at least as long as the carapace proper.
    - i. Rostral spines as long as the carapace, and nearly parallel in their proximal half: carapace indistinctly tuberculated .. .. [*H. sebæ.*]
    - ii. Rostral spines about twice as long as the carapace, and widely divergent from their origin: carapace with numerous tubercles, and with large cardiac, branchial and intestinal spines: a long terminal spine on the merus of of the second pair of trunk-legs .... *H. tenuicornis.*
  - 2. Rostral spines not much more than half the length of the carapace proper.
    - i. Legs coarse, the meropodites of all (including the chelipeds) nodular.
      - a. Numerous tubercles forming a cross on the gastric region: a median transverse tubercle in the groove between the gastric and cardiac regions......... *H. pleione.*
      - b. Gastric region almost smooth: no tubercle between the gastric and cardiac regions........... *H. hilgendorfii.*
    - ii. Legs slender, the meropodites smooth.
      - a. Carapace elongate closely covered with granules and tubercles, without spines..... *H. oryx.*
      - b. Conspicuously large spines on the cardiac and branchial regions......... *H. gracilirostris.*

II. Denuded carapace smooth and polished, with a few large spines.	1. Carapace triangular, with a large epibranchial spine and at least one large sub-hepatic tubercle on either side.	i. A large intestinal and two large gastric spines in the middle line........................		*H. spinosus.*
		ii. No large intestinal spine: a single gastric tubercle in the middle line........................		*H. diacanthus.*
	2. Carapace elongate, with a small epibranchial tubercle, and with none of the sub-hepatic tubercles enlarged.	i. A pair of gastric tubercles in the middle line..................		*H. aries.*
		ii. Gastric region without tubercles.	*a.* An erect claw-like intestinal spine	*H. calvarius.*
			b. No intestinal spine...........	*H. planasius.*

Hyastenus pleione (Herbst).

Cancer pleione, Herbst, Krabben, III. iii. 52, taf. lviii. fig. 5.

Naxia pleione, Gerstaecker. Archiv. fur Naturgesch. XXII. 1856, p. 114, taf. v. figs. 1–2.

Hyastenus pleione, A. Milne-Edwards, Nouv. Archiv. du Mus. VIII. 1872, p. 250.

Hyastenus pleione, de Man, Archiv. fur Naturgesch. LIII. 1887, p. 225, taf. vii. fig. 3; and Journ. Linn Soc., Zool., Vol. XXII. 1888, p. 18.

Hyastenus pleione, Miers, 'Challenger' Brachyura, p. 56.

Hyastenus pleione, J. R. Henderson, Trans. Linn. Soc. (2) V. 1893, p. 343.

Carapace triangular, elegantly rounded behind, pubescent like the legs and rostrum, the regions well-defined, tuberculated as follows:—six tubercles disposed in a Y or cross on the gastric region, one in the groove between the gastric and the extremely prominent cardiac region, one in the middle of the intestinal region, and three in a line on the boundary of the hepatic and pterygostomian regions; on either branchial region are two longitudinal rows of tubercles, the upper row being the more distinct, but the last tubercle in the lower row being the largest, and forming a rather prominent epibranchial spine; finally on either side of the groove separating the cardiac and intestinal regions is a prominent tooth.

The rostrum consists of two slender divergent spines, which in the male are half the length of the carapace proper, but in the female are considerably less.

The basal antennal joint has its outer margin, anteriorly, bilobed.

The hairy trunk-legs have the upper surface somewhat uneven or actually nodular.

The chelipeds in the male are stouter than the other legs, and are as long as the carapace *plus* half the rostrum; the fingers, which are hardly one half shorter than the short palm, are arched and meet only near their tips: in the female the chelipeds are rather more slender than the other legs, are only as long as the post-ocular portion of the carapace, and have nearly straight fingers that meet in the greater part of their extent.

The second pair of legs, in both sexes, are considerably longer than the chelipeds and than any of the three last pairs: the dactyli of all the ambulatory legs are stout, recurved, and serrated along the posterior margin.

In the Museum collection are numerous specimens of both sexes, from Ceylon and Mergui.

Hyastenus hilgendorfii, de Man.

Hyastenus hilgendorfii, de Man, Journ. Linn. Soc., Zool., Vol. XXII. 1888, p. 14, pl. i. figs. 3 and 4.

This species much resembles *H. pleione*, but is distinguished by the following constant characters:—the carapace is but faintly tuberculated, and, in particular, there is no tubercle between the gastric and cardiac regions: the dactyli of the ambulatory legs are very strongly toothed, instead of merely serrated, along the posterior margin: in the male the rostrum is nearly two-thirds the length of the carapace, and the chelipeds are as long as the carapace and rostrum combined, and nearly as long as the second pair of trunk-legs,—this being largely due to the increased length of the palm.

Carapace subpyriform, and, like the rostrum and legs, pubescent; the regions moderately well-defined.

The gastric region is either quite smooth, or presents three faint elevations disposed in a triangle base forwards. There is a small tubercle near the middle of the intestinal region; and a line of granulations along the boundary between the hepatic and pterygostomian regions, which line is continued backwards, along the side of the branchial region, to end at a distinct lateral epibranchial spine: there is also a more or less distinct line of granules on the dorsal aspect of the epibranchial region.

The rostrum consists of two divergent spines, the length of which in the male is nearly two-thirds that of the carapace proper, but is considerably less in the female. Basal antennal joint with the outer margin sinuously curved.

The trunk-legs have the surface somewhat uneven: the chelipeds in the male are much stouter than the other legs, and are as long as the carapace and rostrum, the palm being nearly twice the length of the fingers, which are not much arched and meet in their distal half: in the female the chelipeds are rather slenderer than the other legs, and are equal to the postrostral portion of the carapace in length. The 2nd pair of legs are hardly longer than the (male) chelipeds, but are very much longer than the last three pairs: the dactyli in all are stout, recurved, and strongly toothed along the posterior margin.

Specimens are in the Museum collection from Ceylon, Ganjam, Mergui, the Nicobars, and the Straits of Malacca.

Hyastenus diacanthus (de Haan).

Pisa (Naxia) diacantha, de Haan, Faun. Japon. Crust., p. 96, pl. xxiv. fig. 1.

Naxia diacantha, Adams and White, 'Samarang' Crust., p. 10.

Naxia diacantha, Stimpson, Proc. Acad. Nat. Sci. Philad. 1857, p. 218.

Naxia diacantha, Heller, 'Novara' Crust., p. 3.

Hyastenus diacanthus, A. Milne-Edwards, Nouv. Archiv. du Mus. VIII. 1872, p. 250.

Naxia diacantha, Brocchi, Ann. Sci. Nat. (6) II. 1875, Art. 2, p. 94, pl. xix. figs. 172, 173 (male appendages).

Hyastenus diacanthus, Miers, Cat. Crust. New Zealand, p. 9; and P. Z. S., 1879, pp. 19 and 26; and Zoology H. M. S. 'Alert,' pp. 182 and 194; and 'Challenger' Brachyura, p. 57.

Hyastenus diacanthus, Haswell, P. L. S., N. S. Wales, Vol. IV. 1879, p. 442; and Cat. Austral. Crust., p. 20.

Hyastenus diacanthus, de Man, Archiv. fur Naturgesch., LIII. 1887, p. 220.

Naxia diacantha, C. W. S. Aurivillius, Kongl. Sv. Vet. Akad. Handl. XXIII. 1888-89, No. 4, p. 51, pl. ii. fig. 5.

[*Hyastenus diacanthus*, Cano, Boll. Soc. Nat. Napol. III. 1889, p. 178.]

Hyastenus diacanthus, A. O. Walker, Journ. Linn. Soc., Zool., Vol. XX. 1890, p. 109.

Hyastenus diacanthus, Ortmann, Zool. Jahrb., Syst., etc., VII. 1893, p. 55; and Zool. Forsch. Austral. Malay. Archip., Jena., 1894, p. 42.

Hyastenus diacanthus, Mary Rathbun, Proc. U. S. Nat. Mus. Vol. XVI. 1893, p. 85.

Body and legs densely tomentose, often much encrusted with sponges, etc. Carapace pyriform, with the regions strongly convex, well-defined, and when denuded, smooth and polished: on the gastric region, in the middle line, there is an acuminate tubercle, on either pterygostomian region at least one large tooth, and near the hinder limit of either branchial region a horizontally projecting lateral epibranchial spine.

The rostrum consists of two more or less divergent horns, the length of which in the adult male is from half to nearly two-thirds that of the carapace proper, but in the female is less. The basal antennal joint is much inflated behind and constricted in front.

The chelipeds in the male are stouter than any of the other legs, and are equal in length to the carapace *plus* half the rostrum; the fingers, which are arched and meet in rather less than their distal half, are nearly as long as the short inflated palm. In the female and young male the chelipeds are rather more slender than any of the other legs, and in length are equal to the post-ocular portion of the carapace; and the fingers, which are almost straight, meet in the greater part of their extent. The second pair of trunk-legs are nearly twice the length of the (male) chelipeds, and are far longer than any of the last three pairs: the recurved and densely tomentose dactyli have the posterior margin almost smooth.

Besides specimens from the Australian and Chinese Seas, the Museum possesses specimens from Ceylon, Orissa, Tavoy, and the Andamans.

Hyastenus spinosus, A. Milne-Edwards.

Hyastenus spinosus, A. Milne-Edwards, Nouv. Archiv. du Mus., VIII. 1872, p. 250.
Hyastenus spinosus, Miers, 'Challenger' Brachyura, p. 56.

This species differ from *H. diacanthus* only in the following particulars:—the body and limbs are less densely tomentose; the gastric region, instead of a single acuminate tubercle, has two strong spines in the middle line; there is a stout spine, in the middle line, close to the posterior border of the carapace; the lateral epibranchial spines are larger.

These differences are constant in a large series of specimens from different parts of the sea-coast of India: but in two specimens which seem referable to this species the gastric region is quite smooth, though abnormally convex.

Hyastenus aries (Latr.)

[*Pisa aries*, Latr. Encyc. X. p. 140].
Chorinus aries, Milne-Edwards, Hist. Nat. Crust. I. 315.
Hyastenus aries, A. Milne-Edwards, Nouv. Archiv. du Mus., VIII. 1872, p. 250.
Chorinus aries, Hilgendorf, MB. Ak. Wiss. Berl. 1878, p 786.
Chorinus aries, E. Nauck, Zeits. Wiss. Zool. XXXIV. 1880, p. 41 (gastric teeth).
Hyastenus aries, Miers, 'Challenger' Brachyura, p. 56.

Very closely resembling *H. spinosus*, from which it differs only in the following particulars—adult males of nearly equal size being compared:—(1) the rostral horns, instead of being long cylindrical divergent and down-curved only at tip, are short (being only one-third the length of the carapace proper in the male, and only about one-fourth in the female), somewhat compressed horizontally, almost parallel or even a little incurved, and perceptibly though very slightly deflexed from the base; (2) the carapace is much more convex and swollen, with the lateral epibranchial and the median posterior spines much smaller; (3) the chelipeds have the palm less enlarged, and the fingers nearly straight, instead of arched; (4) the anterior angle of the supra-orbital eave, instead of being sharply produced, is obtuse.

The Museum possesses specimens from the Orissa Coast and Gulf of Martaban, and also from the Straits of Malacca.

Hyastenus planasius, Ad. & White.

Pisa planasia, Adams and White, 'Samarang' Crust., p. 9, pl. ii. figs. 4 and 5.

Hyastenus planasius, A. Milne-Edwards, Nouv. Archiv. du Mus., VIII. 1872, p. 250.

Hyastenus (Chorilia) planasius, Miers, Zoology H. M. S. 'Alert,' pp. 182 and 196; and 'Challenger' Brachyura, p. 57.

Hyastenus planasius, Walker, Journ. Linn. Soc. Zool. Vol. XX. p. 109.

Carapace elongate-ovate, its surface smooth and polished anteriorly, finely granulose posteriorly, and with scattered tufts of hairs: a small eminence in the middle of the gastric region, and a small lateral epibranchial spinule, in front of which latter there may be a line of granules: lateral margin with three spinules anteriorly, two of which are on the pterygostomian region.

The rostrum is formed by two parallel spines, the tips of which are somewhat incurved, and the length of which is about one-sixth that of the carapace proper. The supra-ocular margin is, as usual, very prominent, and has its anterior angle somewhat produced. The antero-external angle of the basal antennal joint forms a distinct tooth visible from above. The legs are tomentose with additional long scattered setæ: the second pair (1st ambulatory legs) are, as usual, markedly the longest, being half again as long as the carapace and rostrum: the dactyli are short, stout, recurved, and serrated posteriorly. The chelipeds are described by Adams and White as follows:—"small, slender, equal in size, covered with scattered long stout hairs; the third joint sub-cylindrical, curved inwards and enlarged anteriorly; fourth joint short, rounded, and curved, with two small tubercles on the outer and upper surface; fifth joint rather slender, sub-cylindrical, laterally compressed; claws slightly gaping in the middle, curved inwards, and finely denticulated." As, however, the male specimen figured does not seem to be adult, these characters are perhaps changeable with age.

In the Museum collection are a young male and female from Ganjam and Arrakan.

Hyastenus calvarius, n. sp.

This species—females alone being available for comparison—differs from *H. planasius* chiefly in the following characters:—(1) there is an erect claw-like spine on the posterior border of the carapace in the middle line; (2) the spines of the rostrum are straight, divergent, and about half the length of the carapace; (3) the dactyli are longer and slenderer.

Three females—two of which are laden with eggs—from the Andamans. The larger egg-laden female measures 14 millim. from the tip of the rostrum to the posterior border of the carapace.

Description of the female.

Carapace elongate-ovate, with the surface, when denuded of scattered setæ, smooth and polished: the gastric region is very convex: the only armature of the carapace is (1) a large erect claw-like spine near the posterior border in the middle line, (2) a small lateral epibranchial spinule on either side, and (3) two or three granules along the antero-lateral border in the pterygostomian region. The rostrum is formed of two straight divergent spines, the length of which is about half that of the carapace proper. The antero-lateral angle of the prominent supra-ocular eave is sharp; and that of the basal antennal joint is produced to form a spine which is plainly visible from above.

The legs are more or less fringed with stout club-shaped hairs: the second pair are, as usual, the longest: the dactyli are long and slender, and are recurved, with the posterior margin serrate. The chelipeds are slender, and the fingers meet in the greater part of their extent.

Hyastenus sebæ, White.

Seba, Thesaurus, III. xviii. 12.

Hyastenus sebæ, White, P. Z S., 1847, p. 57; and Ann. Mag. Nat. Hist., Vol. XX. 1847, p. 61; and 'Samarang' Crustacea, p. 11.

Hyastenus sebæ, A. Milne-Edwards, Nouv. Archiv. du Mus., VIII. 1872, p. 249.

Hyastenus sebæ, de Man, Archiv. fur Naturgesch., LIII. 1887, p. 223.

Hyastenus sebæ, Miers, 'Challenger' Brachyura, p. 56.

Hyastenus sebæ, Ortmann, Zool. Forsch. Austral. Malay. Archip. Jena, 1894, p. 42.

Carapace very elongate-triangular, its surface eroded and sculptured, but without distinct tubercles or spines. The rostral spines, which are equal in length to the carapace, are paralled in their proximal half. The chelipeds in the male are equal in length to the carapace *plus* one-third of the rostrum: their merus is not much stouter than that of the next pair of legs, but the palm is broadened and somewhat inflated: the fingers, which are hardly more than half the length of the palm, are arched, and meet only at the tip. The other legs are slender, the second pair being much longer than the last three pairs and longer than the chelipeds.

The Museum possesses a specimen from Mauritius, which I have included here for the sake of comparison.

Hyastenus oryx, A. Milne-Edwards.

Hyastenus oryx, A. Milne-Edwards, Nouv. Archiv. du Mus., VIII. 1872, p. 250, pl. xiv. fig. 1.

Hyastenus oryx, Haswell, Proc. Linn. Soc., N S. Wales, Vol. IV. 1879, p. 442; and Cat Austral. Crust., p 20.

Hyastenus (*Chorilia*) *oryx*, Miers, Zool. H M. S. 'Alert,' pp. 182 and 195, 517 and 522; and 'Challenger' Brachyura, p. 58.

Hyastenus oryx, de Man, Archiv. fur Naturgesch., LIII. 1887, p. 224, taf. vii. fig. 2.

Hyastenus oryx, C W. S. Aurivillius, Kongl. Sv. Vet. Akad. Handl. XXIII. 1888-89, No. 4, p. 50, pl. iv. fig. 4.

Hyastenus oryx, A. O. Walker, Journ. Linn. Soc., Zool., Vol. XX. 1890, p. 109.

Carapace pyriform, little setose, crisply and rather closely tuberculated, but without any spines, the tubercles on the gastric region being disposed in the form of a cross or anchor. The rostrum consists of two slender horns, which in the male are about half the length of the carapace proper, and strongly resemble the horns of an Oryx in miniature: in the female they are not one-third the length of the carapace, and are nearly parallel.

The supra-ocular eave is sharply angled, but not produced, anteriorly. The basal antennal joint is sharply toothed at the antero-external angle.

The chelipeds in the male are as long as the carapace *plus* two-thirds of the rostrum: their merus is slender, but the palms are broadened and inflated; and the fingers, which are from half to two-thirds the length of the palm, are arched, and meet only at the tip. In the female the chelipeds are considerably shorter than the post-ocular portion of the carapace, and are rather more slender than the ambulatory legs, the fingers being but little arched, and little separated when clenched.

The ambulatory legs are slender, with slender almost smooth actyli: the first pair, which are considerably the longest, are about one-fourth longer than the carapace and rostrum.

This, like *Hyastenus calvarius*, is a small species, an egg-laden female of average size measuring only 14 millim. from the tip of the trum to the posterior border of the carapace. It is a common species at the Andamans, and has also been taken off Ceylon at 34 fathoms.

Hyastenus gracilirostris, Miers.

Hyastenus gracilirostris, Miers, Ann. Mag. Nat. Hist., Vol. IV. 1879, p. 12, pl. iv. fig. 7; and 'Challenger' Brachyura, p. 56.

Carapace subpyriform, hardly at all setose, with numerous sharp tubercles and spinules. Specially noticeable are three spinules, longitudinally arranged in the middle line, on the gastric region, a strong conical spine on the cardiac region, a sharp tubercle on the posterior margin, and two spines on each of the branchial regions, of which the larger occupies the usual position of the lateral epibranchial spine.

The rostrum, which does not vary according to sex, consists of two slender divergent spines, the length of which is about one-third that of the carapace. The post-ocular lobe projects very strongly, and the supra-ocular eave has both the anterior and the posterior angle pronounced. The basal antennal joint has a well-marked tubercle or blunt spine at its antero-external angle.

The chelipeds in the male are equal in length to the post-rostral portion of the carapace, and have a few small granules on the merus carpus and upper edge of the palm; the merus is slender, but the palm is broadened and is not much longer than the fingers, which are arched and meet only at the tip. In the female the chelipeds are rather shorter than the post-ocular portion of the carapace, are very slender, and have nearly straight fingers.

The ambulatory legs are slender, with slender smooth-edged dactyli: the first pair are, as usual, much the longest.

This also is a small species, and egg-laden female of average size being only 10 millim. in length.

In the Museum collection are specimens from the Madras coast.

Hyastenus tenuicornis, Pocock.

Hyastenus tenuicornis, Pocock, Ann. Mag. Nat. Hist., Vol. V. 1890, p. 76.

Distinguished by the enormous length of the rostral spines, and by the curious form—described below—of the supra-ocular eave and post-ocular lobe.

Carapace subpyriform, somewhat depressed, with the regions well-defined; its surface with many long scattered setæ, and with numerous granules and some large spines. Specially noticeable are five or seven granules, arranged in the form of a cross, on the gastric region; two huge acuminate tubercles, in the middle line, posteriorly; and three spines on either branchial region, the hindmost and lowermost of which is of great size.

The rostrum consists of two slender, exceedingly divergent spines, the length of which in the male is about twice, in the female about once and a fifth, that of the carapace.

The post-ocular lobe is unique is form: it is very prominent, and has a stout pedicle and a compressed crown, the angles of which are produced. The supra-ocular eave is also unique: it also is very prominent, and has its antero-external angle produced forwards and upwards, and its postero-external angle produced backwards towards the post-ocular lobe. The basal antennal joint is deeply grooved longitudinally: its antero-external angle forms a strong spine visible from above, and its outer edge bears two distinct teeth which stretch towards the supra-ocular and post-ocular spines respectively. All the trunk-legs are very slender: the first two pairs have a strong spine on the far end of the upper border of the merus, but this in the last three pairs is represented by a small tubercle. The chelipeds, even in the male, are slender throughout, and have long slender fluted palms which are three times the length of the fingers: the latter, though denticulated throughout and but little arched, meet, in the male, only in their distal half.

The first pair of ambulatory legs are, as usual, much the longest: in all the dactyli are long and slender, but have the posterior edge sharply serrated.

This also is a small species, an egg-laden female of average size measuring only 17 millim., more than half of which is rostrum.

Off Cheduba (Arakan coast) 7 fathoms: off Ceylon 30–34 fathoms.

Dr. Henderson (Tr. Linn. Soc., Zool., 1893, p. 344) also includes in the Indian Fauna, but with some doubt, the two following species:—

1. *Hyastenus convexus*, Miers Zool., H. M. S. 'Alert,' p. 196, pl. xviii. fig. B. (*N. E. Australia; Penang.*).

2. *Hyastenus brockii*, de Man, Archiv. fur Naturgesch. LIII., 1887, p. 221, taf. vii. fig. 1. (*Amboina*).

As Dr. Henderson seems to be not quite sure of his identification, and as we have no specimens in the Museum collection, I have not noticed these two species at length.

NAXIA, Edw., Miers.

Naxia, Milne-Edwards, Hist. Nat. Crust. I. 313.

Naxia, de Haan, Faun, Japon. Crust., p. 84.

Naxia, Miers, Journ. Linn. Soc., Zool., Vol XIV. 1879, p. 658 (*et synon.* Naxioides, *A. M. Edw. and* Podopisa *Hilgendorf*); and 'Challenger' Brachyura, p. 59.

Carapace subpyriform, moderately convex, rounded behind, and armed with spines or tubercles on the dorsal surface. Spines of the rostrum well developed, subcylindrical, parallel or divergent, and bearing on the inner margin, near to the extremity, a small accessory spine or spinule. Abdomen (in the male) distinctly seven-jointed; in the female some of the segments may be coalescent. Eyes small, supra-ocular eave very prominent, its antero-external angle sometimes produced to a spine: post-ocular lobe also very prominent, its edge unequally bi- or tri-lobed. Antennæ with the basal joint enlarged, with a spine or tubercle at the antero-lateral angle, and sometimes with another on the outer margin; the flagellum either exposed, or partially concealed in a dorsal view by the rostral spines. Merus of the external maxillipeds distally truncated, with the antero-external angle little, if at all, produced, and the antero-internal angle emarginate. Chelipeds (in the male) slender and moderately developed, palm usually somewhat elongated, fingers denticulated near the distal extremity, and having between them when closed a small hiatus at the base. Ambulatory legs slender and somewhat elongated, the first pair much the longest, with the joints subcylindrical; dactyli nearly straight.

Key to the Indian species of Naxia.

I. Armature of the carapace consisting almost entirely of large clean-cut spines .... *N. hystrix.*

II. Armature of the carapace consisting chiefly of tubercles, among which there are sometimes a few coarse spines.
- 1. Spines of the rostrum parallel to near the tip: supra-ocular spine obsolete: meropodites of the trunk-legs without a terminal spine...... *N. hirta.*
- 2. Spines of the rostrum divergent from the base: supra-ocular spine present: meropodites of some of the trunk-legs with a large terminal spine.
  - i. Spines of the rostrum considerably more than half the length of the carapace: supra-ocular spine very large and acute: meropodites of all the trunk-legs with a terminal spine: palms long and slender.
    - *a.* Rostral spines widely divergent: no large spines on the branchial or intestinal regions ...... *N. taurus.*
    - *b.* Rostral spines moderately divergent: several large spines on the branchial regions and in the middle line of the carapace *N. cerastes.*
  - ii. Spines of the rostrum considerably less than half the length of the carapace: supra-ocular spine blunt: meropodites of the last three pairs of trunk-legs unarmed: palms short and inflated .... *N. investigatoris.*

Naxia investigatoris, n. sp. Pl. IV. fig. 3.

Distinguished from all other Indian species by the form of the male chelipeds, of which the palm, instead of being long and slender, is short and broadly inflated.

Carapace subpyriform, with all the regions well-defined, and the whole surface, from the base of the rostral spines, sharply tubercular.

The rostral spines in the male and sometimes in the female are hardly one-third the length of the carapace proper, and are divergent, with the accessory spine in the middle of the distal half: often, but not always, in the female they are less than one-fourth the length of the carapace, are little divergent, and bear the accessory spinule near the tip. The antero-external angle of the prominent supra-ocular eave is surmounted by a blunt spine: the basal antennal joint has a similar spine at its antero-external angle, and another near the middle of its outer border.

The chelipeds are granular, and their meropodite has a small spinule at the distal end of its upper border: in the male they are a little longer than the carapace, the palm is short — less than twice the length of the fingers — inflated, and enlarged from behind forwards, and the fingers are strongly arched and meet only at the tip: in the female they are only as long as the post-rostral portion of the carapace, are slender throughout, and have nearly straight fingers. The 2nd pair of trunk-legs (1st pair of ambulatory legs) are $2\frac{1}{2}$ times the length of the carapace, and have the meropodite armed with a strong spine at the distal end of its upper border, and the dactylus of remarkable length, nearly equal to the propodite: the other legs are much shorter, and have the spine replaced by a small tubercle, their dactylus being of ordinary length.

Colours in spirit, pale ochre.

Loc. Andamans; and off Ceylon, 34 fathoms.

	Male.	Ovigerous Female.
Length of carapace and rostrum ...	19 millim.	17 millim.
Greatest breadth of carapace ...	10·5 ,,	10 ,,
Length of chelipeds	23 ,,	14 ,,
Length of 2nd pair of legs	41 ,,	36 ,,

Naxia hirta, A. Milne-Edwards.

Naxioides hirta, A. Milne-Edwards, Ann. Soc. Ent. Fr. (4) V. 1865, p. 143, pl. iv. fig. 1.

Podopisa petersii, Hilgendorf, MB. Ak. Berl., 1878, p. 785, taf. i. figs. 1–5.

Naxia petersii, Miers, Zoology of H. M. S. 'Alert,' p. 523.

Naxia hirta, Miers, 'Challenger' Brachyura, p. 61.
Naxia petersii, de Man, Journ. Linn. Soc., Zool., Vol. XXII. 1888, p. 19.
Naxia hirta, Pocock, Ann. Mag. Nat. Hist., Vol. V. 1890, p. 79.
Naxia hirta, Henderson, Trans Linn. Soc., Zool. (2) V. 1893, p. 345.

Carapace pyriform, with the regions well-defined and the surface from the base of the rostral spines unevenly granular and tubercular. From the rough surface there stand out (1) at least two good sized spines on either branchial region, (2) a sharp unciform tubercle close to the posterior border near the middle line, and (3) a stout nipple-shaped tubercle near the middle of the pterygostomian region.

The rostral spines, which in both sexes are close together and parallel in more than half their extent, are from one-third (male) to two-sevenths (female) the length of the carapace proper; from the point of origin of the accessory spines, which are situated at the end of the parallel portion, they are elegantly divergent.

The prominent supra-ocular eave has the antero-external angle slightly upturned. The basal antennal joint has a stout spine anteriorly, and a coarse tooth in the middle of its outer border.

The chelipeds are smooth, and are slender in both sexes, but most so in the female: in the male they are equal in length to the post-rostral, in the female to the post-ocular portion of the carapace: the palms are slender and sub-cylindrical, and are twice the length of the fingers, which latter are hardly arched, and are therefore but slightly separated at the base when clenched.

All the ambulatory legs are slender and smooth, and the first pair are considerably the longest, being nearly twice the length of the carapace and rostrum, the dactylus not being abnormally elongate.

The body and legs are covered with a short fine down, and the colour in spirit is usually mottled reddish and yellow.

In the Museum collection are specimens from the Andamans and from Ceylon.

Naxia taurus, Pocock.

Naxia taurus, Pocock, Ann. Mag. Nat. Hist. Vol. V. 1890, pp. 77 and 79.
Naxia taurus, Henderson, Trans. Linn. Soc., Zool. (2) V. 1893, p. 346.

Distinguished by the very long and widely divergent rostral spines.

Carapace pyriform, with the regions well-defined, and the surface, from the base of the rostral spines, unevenly granular and tubercular beneath tufts of hair. Among the tubercles three on the gastric region in the middle line, three in a triangle on the intestinal region, and three on either branchial region attract attention.

The rostral spines, which are considerably more than half the carapace in length, are widely divergent—the distance between their tips being more than three-quarters of their length: the accessory spine is situated not far in front of the middle.

The prominent supra-ocular eave has a strong sharp spine, and there is an even stronger and sharper spine at the antero-external angle of the basal antennal joint, as well as a prominent tooth near the middle of the outer border of this joint.

The chelipeds are granular: in the male they are equal in length to the carapace *plus* four-fifths of the rostrum, and, though slender, are considerably stouter than the other legs, especially as to the palm, which is more than twice the length of the fingers—the fingers being but little curved and therefore but little separated when closed: the meropodite has a strong sharp spine at the distal end of its upper border.

The ambulatory legs are slender: the meropodites of all but the last pair are armed as to the distal end of the upper border with a spine, which is of conspicuous size in the case of the first pair. The first pair are markedly the longest, being nearly twice the length of the carapace measured with the long rostrum, and have the dactylus extremely long—nearly equal in length to the propodite.

A single male specimen occurs in the collection, having been dredged off the Andamans in 36 fathoms.

Naxia cerastes, Ortmann.

Naxia cerastes, Ortmann, in Semon, Zool. Forschungreisen Austral. und Malay. Archipel., Crust., p. 43, taf. iii. fig. 4.

This species appears to be very similar to *Naxia taurus*, with which it may, perhaps, even be identical. It differs from *Naxia taurus*, comparing specimens of the same size and sex, in the following unimportant particulars:—(1) the rostral spines are less divergent; (2) the carapace, in addition to the granules and tubercles, is armed with several large spines, of which three on either branchial region and one on the intestinal region are of conspicuous size, while several in the middle line on the gastric and cardiac regions are hardly smaller.

In the collection are a perfect male and female from the Andamans.

Naxia hystrix, Miers.

Naxia hystrix, Miers, 'Challenger' Brachyura, p. 60, pl. vi. fig. 4.

Naxia hystrix, R. I. Pocock, Ann. Mag. Nat. Hist., Vol. V. 1890, p. 79.

Naxia hystrix, Ortmann, Zool. Forsch. in Austral. und Malay. Archipel., Crust., p 43.

Body closely beset with short knobbed hairs, among which longer setæ are interspersed.

Carapace subpyriform, armed with numerous long sharp spines as follows: — four, arranged in a triangle base forwards, on the gastric region; one on the cardiac, and one (very large) on the intestinal region; one on either hepatic region; two or three on either pterygostomian region; and, finally, on either branchial region three dorsal and three lateral: between these large spines some spinules and sharp granules are interspersed. In the male there is a pair of strong spines on the sternum between the chelipeds; and each abdominal tergum has a strong median spine: in the female five parallel rows of spines are found on the ventral surface, three of which belong to the abdominal terga, and one on either side to the sternum.

The rostral spines are short (about one-fifth the length of the carapace in the male, and rather less in the female), and divergent: the accessory spinule is found on their inner margin near the tip.

The basal antennal joint has a sharp spine at its antero-external angle, and a tooth near the middle of its outer margin. The antero-external angle of the prominent supra-ocular eave is surmounted by a sharp spine.

The chelipeds in the female and young male are rather more slender than the other legs, and are a little longer than the carapace and rostrum: the palms are slender and subcylindrical, and are nearly three times as long as the fingers, which are nearly straight and apposable throughout. The ambulatory legs are slender, and have very long slender dactyli: the first pair, which are much the longest, are nearly three times as long as the carapace and rostrum.

In the Museum collection are specimens from the Andaman Sea down to 40 fathoms.

CHORILIBINIA, Lockington, Miers.

Chorilibinia, Lockington, Proc. Ac. Nat. Sci. Calif., Vol. VII. 1876, p. 69.

Chorilibinia, Miers, Journ. Linn. Soc., Zool., Vol. XIV. 1879, p. 45; and 'Challenger' Brachyura, p. 45.

Chlorolibinia, Haswell, Cat. Austral. Crust., p. 17.

Carapace broadly subpyriform, spinose. Rostrum formed of two spines which are coalescent in their basal half. The commencing orbit, which does not afford much concealment to the fully retracted eye, is formed by a little-prominent supra-ocular eave, and a cupped (and isolated) post-ocular tooth. The basal antennal joint is broad, has its antero-external angle more or less produced, and has also a lobe on its outer margin, near the base. Merus of the external maxillipeds as broad as the ischium, and with the antero-external angle produced.

Chelipeds slender; ambulatory legs very long and slender. Abdomen of the male consisting of seven distinct segments.

Chorilibinia andamanica, n. sp. Plate V. figs. 2, 2*a*.

Distinguished from *Chorilibinia gracilipes*, Miers (Ann. Mag. Nat. Hist. Vol. IV. 1879, p. 7, pl. iv. fig. 4), (1) by the much less divergent rostral spines; (2) by the pair of great spines—one pointing forwards, the other backwards—on the cardiac region; (3) by the much slenderer chelipeds.

Carapace broadly subpyriform, with (1) a median line of tubercles and spines increasing in size from before backwards, four of the spines—namely one on the after limit of the gastric region, two on the cardiac region, and one near the posterior border—being conspicuously large; and with (2) on either side a supra-marginal line of spines as follows—a tooth at the angle of the buccal frame, a large hepatic spine pointing downwards, and four branchial spines, the last of which directed obliquely backwards is much the largest. Besides these large spines there are numerous, symmetrically disposed, sharp granules. The rostrum, which measured from the anterior border of the orbit is about one-third the length of the carapace proper, ends in two very slightly divergent spines.

The eyes are short and thick; and the orbit is formed by a moderately prominent supra-ocular eave separated by a narrow interval from a broad isolated post-ocular pocket.

The basal antennal joint is moderately broad, and bears two teeth, one at the antero-lateral angle, the other at the base—the latter inclining towards the post-ocular pocket.

The external maxillipeds completely close the buccal frame, the merus being as broad as the ischium.

The chelipeds are not stouter than the legs, and are but little longer than the carapace (rostrum included): the next pair of legs are considerably more than three times, and the third pair are about three times, this length; while the 4th and 5th pairs are very short.

The abdominal segments from the third to the sixth inclusive, are coalescent.

The sternum between the chelipeds carries a pair of very strong sharp teeth.

Loc. Andamans.

EGERIA, Leach.

Egeria, Leach, Zool. Miscell. Vol. II. p. 39.

Egeria, Milne-Edwards, Hist. Nat. Crust. I. 290.

Egeria, Miers, Journ. Linn. Soc., Zool., Vol. XIV. 1879, p. 654; and 'Challenger' Brachyura, p. 44.

Carapace subpyriform, nearly as broad as long, convex and tuberculated. The rostrum consists of two vertically compressed spines of no great length, which are fused together in half or more of their extent. The eyes are short. The commencing orbits are formed by a supra-ocular eave and a post-ocular tooth, the interval between this tooth and the supra-ocular eave above, and between it and the basal antennal joint below, being partly closed in each case by a spine. The basal antennal joint is truncate-triangular; its antero-external angle is produced, and there is a second spine behind the middle of the outer border: the mobile portion of the antenna is visible from above on either side of the rostrum. The merus of the external maxillipeds is as broad as the ischium. Chelipeds in the adult male considerably longer than the carapace and rostrum, and having the palms inflated. Chelipeds in the female very slender throughout, and a little longer than the carapace and rostrum. Ambulatory legs extremely long and slender, the first pair being about six times the length of the carapace and rostrum: the dactylus in all is remarkably long. Abdomen of male seven-jointed: of female five-jointed.

Egeria arachnoides (Rumph), Edw.

Egeria arachnoides, Rumph, pl. viii. fig. 4; [and Latreille, Encyc. Pl. 281, fig. 1;] and Milne-Edwards, Hist. Nat. Crust., I. 291; and Neumann, Syst. Uebers., 1878, p. 19; and Haswell, P. L. S., N. S Wales, IV. 1879, p. 439, and Cat. Austr. Crust., p. 11; and Miers Zool. Alert, pp. 182 and 191, and 'Challenger' Brachyura, p. 44; and C. W. S. Aurivillius, Kongl. Sv. Vet. Ak. Handl., XXIII. 1888-89, No. 4, p. 44; and Ortmann, Zool. Jahrb. Syst. etc., VII. 1893, p 48; and J. R. Henderson, Trans. Linn. Soc. Zool. (2) V. 1893, p. 343.

Cancer longipes, Herbst, Krabben, I. ii. 231, pl. xvi. fig. 93; and Fabricius Syst. Ent. ii. 466.

Inachus longipes, Fabr. Suppl., p. 358.

Macropus longipes, Latr. Hist. Nat. Crust. VI. 111.

Leptopus longipes, Lamk. Hist. An. Sansvert. V. 235; and Desmarest Consid. Crust. p. 159; [and Guérin, Icon. Reg. An. Crust., pl. x. fig. 3]; and Cuvier, Regne An. Crust., pl. xxxiv. fig. 1; and Adamsand White, 'Samarang' Crust., p. 7; and Stimpson, Proc. Ac. Nat. Sci., Philad., 1857, p. 216; and A. O. Walker, Journ. Linn. Soc. Zool., XX. p. 109; and M. J. Rathbun, P. U. S. N. M., XVI. 1893, p. 95.

Egeria indica, Leach, Zool. Miscel. II. pl. lxxiii; and Desmarest, Consid. Crust., p. 157, pl. xxvi. fig. 2; and Milne-Edwards, Hist. Nat. Crust. I. 292; and Adams and White, 'Samarang' Crust., p. 6; and E. Nauck, Zeits. Wiss. Zool. XXXIV. 1880, p. 41 (gastric teeth).

Egeria herbstii, Milne-Edwards, Hist Nat. Crust. I. 292; and Heller, 'Novara' Crust., p. 4; and Haswell, P. L. S., N. S. Wales, IV. 1879, p. 439, and Cat. Austr. Crust., p. 12.

Our large series of perfect specimens fully supports Mr. Miers' conclusion that all the hitherto described species of *Egeria* may be regarded as identical with the species rather poorly figured in Rumph's *Amboinische Rariteitkamer*.

Carapace subpyriform, or, rostrum excluded, subcircular, its breadth being equal to its length behind the base of the eye-stalks: the regions are distinctly delimited, and the surface is uneven and armed with some symmetrically disposed spines and spinules of which the six following are very conspicuously large, namely :—in the middle line, one on the cardiac and one on the intestinal region, and, on either side, a subhepatic and a lateral epibranchial: besides these there is (1) a conspicuous set of spinules arranged in the form of a T on the gastric region—the last in the vertical limb of the T being a distinct spine; and (2) two series of distant spinules on either branchial region.

The rostrum varies somewhat: it is always short, and typically, consists of two vertically compressed spines which are fused in rather more than half their extent and have the tips slightly divergent: but sometimes the fusion is more extensive, or the tips are broken, and the rostrum then has the form of an emarginate stump. The supra-ocular eave is surmounted by a small sharp tooth anteriorly.

The chelipeds in the adult male are more than half again as long as the carapace and rostrum: the merus is a little enlarged distally, and the palm is inflated and distally enlarged: the fingers, which are half the length of the palm, are slightly separated at the base when clenched.

The chelipeds in the female are only one-fourth longer than the carapace and rostrum, and are the slenderest of all the trunk-legs.

The first pair of ambulatory legs are at least six times the length of the carapace and rostrum, rather more than a third of their extent being formed by the dactylus: the other legs gradually decrease in length to the fourth and last, which are about 2½ times the length of the carapace and rostrum. The joints in all are very slender, cylindrical, and except for a spine at the distal end of the upper border of the merus, quite smooth.

Conspicuous on the sternum of the male is a pair of large teeth, placed between the front legs.

The body and lege are usually covered with an excessively short fine down: the legs are often banded, sometimes very distinctly, with dull red.

Egeria investigatoris, n. sp.

This species closely resembles *Egeria arachnoides*, adult males being compared, but differs in the following particulars : — (1) the carapace is more nearly circular, owing to the greater convexity of the hepatic and pterygostomian regions ; (2) the spines on the carapace, although almost tho same in arrangement, are markedly larger : (3) the sternum has a transverse group of spines on every segment ; (4) every abdominal tergum except the last has a large median spine ; (5) the hiatus between the post-ocular tooth and the basal antennal joint is scarcely affected by a small denticle ; (6) the chelipeds in the adult male are $2\frac{1}{3}$ times the length of the carapace, and have the palm long, very slender, and cylindrical, and the fingers sharply and evenly denticulated all along their apposable edge.

The legs are in fragments, but the joints that remain are extremely long and slender.

Length of carapace and rostrum ...	24+5 = 29	millim.
Breadth of carapace	24	„
Length of male chelipeds	65·5	„

Loc. Off Ceylon, 32 fathoms.

DOCLEA, Leach.

Doclea, Leach, Zool. Miscell., Vol. II. p. 41.
Doclea, Milne-Edwards, Hist. Nat. Crust. I. 292.
Doclea, Miers, Journ. Linn. Soc., Zool., Vol. XIV. 1879, p. 652.

Body and appendages tomentose, usually very densely so.

Carapace circular, armed at the sides, and often on the dorsal surface also, with a few spines.

The rostrum consists of two vertically compressed spines which are fused together in almost the whole of their extent and are usually short : it has hence, usually, the appearance of a short flat emarginate beak, hardly breaking the general outline of the carapace. (In one species — *Doclea tetraptera* — the rostrum is rather long).

The eyes are very small, and the commencing orbits are formed by an acute post-ocular tooth and a little-prominent supra-ocular eave. The antennæ are very short and inconspicuous — not reaching to the end of the short rostrum : the basal joint is short, broadly triangular, the apex forming a sharp tooth : the flagella are almost rudimentary.

The buccal frame is somewhat arched in front. The external maxillipeds have the merus rather broader than the ischium, the antero-external angle being slightly produced.

The chelipeds are short and slender in the female ; longer, stout, with an enlarged and inflated palm, in the adult male.

The abdomen consists of seven segments in the male, and of seven in the female of all except *D. muricata* and *hybrida.*

Key to the Indian species of Doclea.

- I. Pterygostomian regions distinctly canaliculated fore and aft.
  - 1. Rostrum elongate — one-fourth to two-fifths the length of the carapace proper, and with the points very widely divaricated: the last lateral and the median posterior spines of huge size…………… *D. tetraptera.*
  - 2. Rostrum short — one-sixth the length of the carapace proper — and with no marked divergence of the tips.
    - i. Two lateral spines on the branchial region: no median posterior spine…. ………… *D. ovis.*
    - ii Three lateral spines on the branchial region, the last being short: a short median posterior spine: no spines on the dorsum of the carapace……. *D. japonica.*
    - iii. Three lateral spines on the branchial region, the last being, like the postero-median spine, long: a line of tubercles, two of which are usually produced to form spines, down the middle of the carapace………… *D. canalifera.*
- II. Pterygostomian regions not canaliculated.
  - 1. Carapace discoid: 2nd pair of trunk-legs three to four times the length of the carapace: a single series of tubercles or spines down the middle of the carapace… ……. ……………………… *D. gracilipes.*
  - 2. Carapace globular: 2nd pair of trunk-legs hardly twice the length of the carapace: a short series of tubercles or spines on either branchial region parallel to a long mid-dorsal series of tubercles or spines
    - i. Tubercles, not spines on the carapace…………… *D. hybrida.*
    - ii. Spines not tubercles, on the carapace………… *D. muricata.*

Doclea ovis (Herbst), Edw.

Cancer ovis, Herbst, Krabben, I. ii. 210, tab. xiii. fig. 82; and Fabricius, Syst. Ent. II. 459.
Inachus ovis, Fabricius, Supplement, p. 355.
[*Maia ovis*, Bosc. I. 256]; and Latreille, Hist. Nat. Crust. VI. 100.
Doclea ovis, Milne-Edwards, Hist. Nat. Crust. I. 294.
Doclea ovis, Cuvier, Règne Animal, Crust., pl. xxxiii. fig. 2.
Doclea ovis, Adams and White, Zool. 'Samarang,' Crust., p. 7.
Doclea ovis, A. O. Walker, Journ. Linn. Soc., Zool., XX. 1890, p. 109.

Body and appendages, except the hands and the tips of the dactyli, covered with an extremely dense soft fur.

Beneath the fur the carapace is almost smooth, its surface being hardly broken by a median line of pimples on the gastric region; but its antero-lateral border, on each side, is armed with four sharp teeth of about equal size—one at the angle of the buccal frame; one, which has sometimes a tubercle at its base, on the sub-hepatic region; and two on the front part of the branchial region. The basal antennal joint has also the form of a tooth, and midway between it and the tooth at the outer angle of the buccal frame is another tooth. So that, including the pointed basal antennal joint, the antero-lateral margin of the carapace shows six teeth: there is no spine, though occasionally a trace of a tubercle, on the posterior border.

The rostrum hardly breaks the general subcircular outline of the carapace: it is cleft at the tip, and, measured at the level of the base of the post-ocular tooth, is broader than long.

The pterygostomian region is longitudinally grooved. The chelipeds in the old male are 1¼ times the length of the carapace and rostrum, and are enlarged, especially as to the palm, which is ¾ as broad as long, and is inflated on the inner side: the fingers also are stout and meet only in (about) the distal third. In the female the chelipeds are only about ¾ the length of the carapace and rostrum, and are throughout slenderer than the other legs. The 2nd pair of trunk-legs (first ambulatory legs) are from twice to 2¼ times the length of the carapace and rostrum.

The abdomen in both sexes consists of seven distinct segments, and the second segment in the female bears a large median elevation.

A common species in muddy waters in the vicinity of the mouths of the large rivers of India.

Doclea japonica, Ortmann.

Doclea japonica, Ortmann, Zool. Jahrb. Syst., &c., VII. 1893, p. 46, pl. iii. fig. 4.

The only differences between this species and *Doclea ovis* are (1) that, instead of only two spines on the lateral border of the branchial region, there are *three*, the last being the largest and being placed rather higher up, (so that, including the tooth-like basal antennal joint, there are seven points on the antero-lateral border of the carapace); and (2) that there is a coarse spine, or blunt tooth, on the posterior border of the carapace.

I do not think that these differences are of more than varietal value; for it is not uncommon in *Doclea ovis*, after careful denudation, to find traces of tubercles corresponding to the additional spines of *D. japonica*.

In the Museum collection are specimens from the mouth of the R. Hooghly.

Doclea canalifera, Stimpson.

Doclea canalifera, Stimpson, Proc. Acad. Nat. Sci., Philad., 1857, p. 217.

Body and appendages, except the fingers and dactylopodites, covered with a dense velvet-like tomentum. Carapace subcircular with a line of tubercles or spines down the middle line, namely, some minute tubercles (only visible on the denuded carapace), followed by a spine, on the gastric region; a larger spine on the cardiac region; and a much larger one still on the posterior border: the antero-lateral border is armed with four spines, the first bounding the outer edge of the pterygostomian canal, the last, which is rather larger than the spine of the posterior border, standing near the middle of the branchiostegal border: in addition, there is a small spine at the outer angle of the buccal frame, but no spine between this and the basal antennal joint; and there is a line of extremely faint tubercles, only visible after complete denudation, stretching obliquely on either side from near the front towards the last epibranchial spine.

The rostrum, which is hardly longer than the breadth between the eyes, is sharply and deeply bifid at tip.

The pterygostomian region is longitudinally grooved. The chelipeds (in the young male) are slenderer than the next pair of legs, and are equal to the length of the carapace between the base of the rostrum and the base of the spine on the posterior border. The second pair of trunk-legs, which are the longest, are a little less than twice the length of the carapace and rostrum.

Abdomen of the male seven-jointed.

In the Museum are specimens from the mouth of the Hooghly and from the muddy estuarine coasts of Orissa and of Arakan.

Doclea gracilipes, Stimpson.

Doclea gracilipes, Stimpson, Proc. Ac. Nat. Sci., Philad., 1857, p. 216.

Doclea sp. De Man, Mergui Crust., Journ. Linn. Soc., Zool., XXII. 1888, p. 13.

Doclea andersoni, De Man, op. cit., tom. cit., p. 11, pl. i. fig. 1.

Carapace discoidal, covered, as are also the legs as far only as the end of their merus or carpus, with a short close fur.

Rostrum, measured from the posterior orbital border, sometimes as long as broad and about one-seventh the length of the carapace, sometimes twice as long as broad and about one-fourth the length of the carapace; deeply cleft, the spines sometimes convergent, sometimes almost in contact throughout, sometimes slightly divergent.

Besides a line of four teeth, situated one at the end of the basal antennal joint, one at the angle of the buccal frame, and one behind each of these, the antero-lateral margin is armed with four acute curved claw-like spines, the posterior of which is typically two-fifths to one-third the breadth of the carapace in length, but may sometimes be only one-eighth the breadth of the carapace in length; while the three anterior are typically about one-sixth the breadth of the carapace in length, but may sometimes be merely tubercles.

In the middle of the posterior border is a great spine as large as the last spine of the antero-lateral series.

In the middle line of the carapace is a series of tubercles and spines which are very variable in size: typically only two are prominent, and these have the form of upstanding spines, one in the gastric region, the other—much larger—in the cardiac region. Both of them, however, may be reduced to tubercles, while in front of them and also between them there may or may not be a line of tubercles.

Except for this median line of elevations, the dorsum of the denuded carapace is either smooth, or has only a line of extremely indistinct elevations passing on either side obliquely from near the front towards the great lateral epibranchial spine.

The chelipeds in the female are rather shorter than the carapace: in the male they are rather longer than the carapace, and in the adult male have the palms swollen.

The 2nd pair of trunk-legs are between three and four times the length of the carapace measured from the base of the rostrum to the base of the great median posterior spine.

The two spines on the sternum between the bases of the second pair of legs may be distinct or indistinct.

The abdomen consists of seven distinct segments in both sexes.

In this variable species the constant characters are :—

(1) the discoid (*i.e.*, non-globose) carapace, with elevations only down the middle line:

(2) the long slender legs of the second pair.

(3) the large size of the spine at the external angle of the buccal frame.

In the Museum collection are specimens from the Sandheads, R. Hughli; Mergui; Andamans; and also from Hong Kong, whence the species was originally described by Stimpson.

Doclea muricata (Herbst), Edw.

Cancer muricatus, Herbst, Krabben, I. ii. 211, tab. xiv. fig. 83; and Fabricius, Ent. Syst. II. 459.

Inachus muricatus, Fabricius, Supplement, p. 355.

[*Maia muricata*, Bosc, I. 255.]

Doclea muricata, Milne-Edwards, Hist. Nat. Crust. I. 295.

Doclea muricata, Adams & White, 'Samarang' Crustacea, p. 8.

Doclea muricata, E. Nauck, Zeits. Wiss. Zool., XXXIV. 1880, p. 38, (gastric teeth).

Doclea muricata, C. W. S. Aurivillius, Kongl. Sv. Vet. Akad. Handl., XXIII. 1888-89, No. 4, p. 43, pl. iv. fig. 5.

Doclea muricata, A. O. Walker, Journ. Linn. Soc., Zool., XX. 1890, p. 109.

Doclea muricata, Henderson, Trans. Linn. Soc., Zool. (2) V. 1893, p. 342.

Body and legs, except the hands and dactyli, closely covered with crisp very short velvet.

Carapace subglobular. Rostrum short, distinctly bifid. Besides the spine formed by the basal antennal joint, and two denticles at the outer angle of the buccal frame, the antero-lateral margin is armed with four spines, the last of which, situated near the middle of the branchiostegal border, is considerably the largest. The carapace is traversed fore and aft in the middle line by a row of sharp spines, the last of which, situated on the posterior border, is considerably the largest. Between the median and lateral rows of spines, on the branchial region on either side, are two large spines, one behind the other. There are thus five series of spines upon the carapace, which is otherwise characterized by the distinct delimitation of its regions, and by a sort of festooning of the border between the median and lateral series of regions.

The chelipeds are slender throughout in both sexes, and are hardly equal in length to the carapace measured from the base of the rostrum to the base of the posterior spine: the second pair of trunk-legs are rather more than twice the length of the chelipeds.

The abdomen consists of seven distinct segments in the male; and of four in the female, the 3rd to the 6th being fused.

Of 24 specimens from different parts of India there is not one of great size, nor a single adult female.

I believe that this species is only the young form of *Doclea hybrida.*

Doclea hybrida (Fabr.), Edw.

Inachus hybridus, Fabricius, Supplement, p. 355.

[*Maia hybrida*, Bosc, I. 256]; and Latreille, Hist. Nat. Crust., VI. 99.

Doclea hybrida, Milne-Edwards, Hist. Nat. Crust, I. 294.

Doclea hybrida, Adams and White, 'Samarang' Crustacea, p. 7.

Doclea hybrida, Bleeker, Recherches Crust. Ind. Archipel., p. 9.

Doclea hybrida, De Man, Mergui Crust., Journ. Linn. Soc., Zool., XXII. 1888, p. 9.

Doclea hybrida, Henderson, Trans. Linn. Soc., Zool. (2) V. 1893, p. 342.

? *Doclea hybridoidea*, Bleeker, Recherches Crust. Ind. Archipel., p. 8.

This species differs from *Doclea muricata*, only in the following characters, which, I think, are merely due to age:—

(1) it is much larger;

(2) the spine of the antero-lateral series is (except in small females) the smallest, and tubercles are found instead of spines on the dorsal surface of the carapace, the tubercles corresponding in number and position with the spines of *D. muricata*;

(3) the chelipeds in the adult male are nearly as long as the carapace and rostrum, and have the hands enlarged.

As in *D. muricata* the female abdomen consists of four segments.

As Fabricius, *loc. cit.*, says of this species compared with *D. muricata*, *vix distinctus videtur.*

We have 29 good specimens from different parts of India, all being large males and egg-laden females. I think that they can only be the adult stage of *Doclea muricata.*

Doclea tetraptera, A. O. Walker.

Doclea tetraptera, A. O. Walker, Journ. Linn. Soc., Zool., Vol. XX. 1890, p. 114 pl. vi. figs. 4–8.

Body and legs, except the hands and dactyli, covered with a dense stiff fur, so stiff on the trunk-legs as to give their joints, though cylindrical, a sharply quadrangular or triangular sectional form.

The circular form of the carapace is a good deal obscured by the unusual development of the rostrum and of the lateral-epibranchial and postero-median spines.

The rostrum is from one-fourth to two-fifths the length of the carapace proper, and ends in two widely divaricated spinules.

In addition to the tooth formed by the basal antennal joint, and to a stout tooth at the angle of the buccal frame, the antero-lateral margin bears four large spines: of these, one, situated on the pterygostomian region, is turned downwards to assist in forming a pterygostomian canal somewhat similar to that of *Doclea canalifera*, etc.: of the other three, which are situated on the branchiostegal region, the last is by far the longest and stoutest—being from one-third to half the length of the carapace—and is directed a little backwards and upwards. Down the middle line of the carapace runs a row of spines, increasing in size from before backwards to the last, which, situated on the posterior border, consists of two branches, one branch directed vertically upwards, the other directed horizontally backwards, the horizontal branch being often half the length of the carapace proper.

On the anterior part of the branchial region, midway between the middle line and the lateral border of the carapace, is a stout spine, visible without any denudation.

The chelipeds in the adult male are equal in length to the carapace and rostrum, and have the hands much broadened, inflated, and very elegantly carinated along the lower border, and the fingers evenly denticulated but not closely apposable in all their extent. In the female the chelipeds are not much more than half as long as the carapace *plus* rostrum and posterior spine, and are rather slenderer than the other legs, the fingers also being closely apposable throughout. In young males, of the size figured by Mr. Walker, the enlargement of the hands is much less marked than in old males.

The second pair of trunk-legs, which are the longest, are from twice to 2½ times the length of the carapace measured from the base of the rostrum to the base of the great postero-median spine.

The sternum in the male has a pair of sharp teeth on its first segment.

The abdomen in both sexes consists of seven separate joints.

Colours in life: dull chocolate, spines white-tipped, chelipeds ivory tinged with pink, legs brownish pink with bright red dactyli.

This species, of which we have a very fine old male, two younger males of different sizes, an adult female, and a young female, appears to be extremely close to *D. calcitrapa*, White (Proc. Zool. Soc., 1847, p. 56; Ann. Mag. Nat. Hist., Vol. XX. 1847, p. 61; and 'Samarang' Crustacea, p. 7, pl. i. fig. 2). It appears to differ from *D. calcitrapa* only in the proportions of the legs, which are slender and very long in the last-named species.

It may be mentioned that the rostrum and great spines of the carapace are, judging from the state of two of our specimens, liable to be broken and only very imperfectly repaired again.

Our specimens all came from the vicinity of the mouth of the River Hooghly.

Alliance II. LISSOIDA.

HOPLOPHRYS, Henderson.

Hoplophrys, Henderson, Trans. Linn. Soc., Zool., Vol. (2) V. 1893, p. 346.

Carapace subovate (elongate pentagonal), with the regions moderately defined and the surface spinose. The rostrum is composed of two short, flattened, acute, divergent spines. The commencing orbits are formed by a supra-ocular eave which has its antero-external angle very strongly and acutely produced, and which is in close contact with a slightly excavated post-ocular tooth, only a very narrow fissure being left between: below, there is no trace of an orbital floor. The eyes are short, and even when fully retracted the cornea is hardly at all concealed from dorsal view. The basal antennal joint is very acutely triangular, the spinous termination being distinctly visible from above: the very short slender mobile portion of the antenna is exposed. The antero-external angle of the merus of the external maxillipeds forms a foliaceous lobe: the merus therefore is broader than the ischium; the palp is attached to its internal angle. The trunk-legs are strongly spinose: the chelipeds, even in the adult male, are slender, but still differ from those of the female in having the fingers more arched and closely apposable only in the distal half.

The abdomen in the male consists of seven distinct segments; but in the female of only five — the fourth to the sixth being fused together.

Hoplophrys oatesii, Henderson.

Hoplophrys oatesii, Henderson, Trans. Linn. Soc. Zool., 1893, p. 347, pl. xxxvi. figs. 1–4.

The gastric region of the carapace is prominent, with two curved rows of spines, the front row (convex anteriorly) consisting of seven spines of which the middle one is the largest, the back row (slightly convex posteriorly) consisting of three spines of which the middle one — the largest of all the spines on the gastric area — is compressed laterally. On the cardiac area, as well as on the gastric area, are two spines placed side by side. On either branchial area are three spines arranged in a triangle, of which the anterior is the largest of all the spines on the carapace, while the most external, which occupies the lateral epibranchial angle, is the most acute and is also unequally bifid. There are also two or three spinules on the hepatic area. Between the spines the surface is perfectly smooth and polished, although there are some tufts of stiff clean hairs.

The rostrum, which consists of two very acute and slightly divergent teeth, is about one-fourth the length of the carapace proper.

The supra-ocular eave is produced forwards as a very acute spine, the base of which is surmounted by a secondary spine. The cornea is surmounted by a spinule.

The chelipeds have the merus slightly, and the carpus strongly spiny, and are equal to the carapace (without the rostrum) in length: they are almost alike in the adults of both sexes, the fingers only of the male differing from those of the female in being closely apposable only in the distal half, instead of throughout. The ambulatory legs, which are about equal to the chelipeds and to one another in length, have the merus carpus and propodite spiny, and the dactylus stout, claw-like, and denticulated on part of the posterior margin.

In the Museum collection are an adult male and an egg-laden female taken by myself, off the Ganjam Coast in 15-25 fms., from a colony of *Spongodes.* The *Spongodes* which belongs to a species (I think new) intermediate in character between *S. cervicornis* and *S. pustulosa*, W. and S., is one of those with a brilliant white cœnosarc and pink zooids, so that the crabs with their porcelain-white bodies, pink spines, and pink-banded legs were with difficulty detected.

Dr. Henderson considers the above species to be closely related to *Schizophrys* and *Microphrys,* but it appears to me to be much more closely related to *Pisa* and *Tylocarcinus.*

TYLOCARCINUS, Miers.

Tylocarcinus, Miers, Journ. Linn. Soc., Zool., Vol. XIV. 1879, p. 664. (*Pisa*, Latr. *part.* ; *Pisa*, Edw. *part.* ; *Milnia*, Stimpson *part.* ; *Microphrys*, Edw. *part.*)

Carapace tuberculated, pyriform, without lateral spines. The rostrum consists of two slender slightly divergent spines.

The eye-stalks are short and are retractile, but not to such an extent as to completely conceal the cornea. The commencing orbits are formed by a supra-orbital eave, the anterior angle of which is produced forwards as a spine roughly parallel with the rostrum, and of a strongly cupped post-ocular process which, instead of being isolated, is in the closest contact above with the supra-ocular eave and below with the basal antennal joint. The basal antennal joint, which is of no great breadth, has its antero-external angle produced to form a sharp tooth, which is not visible from above: the mobile portion of the antenna, which is short, is completely exposed.

The external maxillipeds have the merus as broad as the ischium, and the palp attached to the internal angle of the merus.

The chelipeds in the adult male are somewhat stouter than the other legs, have the palm short and enlarged, and the fingers arched and meeting only at tip: in the female they are slenderer than the other legs, have the palm slender, and the fingers closely apposable throughout. The ambulatory legs are stout, and have the dorsal surface sharply nodose or coarsely spinose.

The abdomen in both sexes consists of seven distinct segments.

This genus, which appears to me to be but slightly distinct from *Pisa* (e.g., *Pisa corallina*), Riss., shows the transition towards *Tiarinia* in the next group.

That it should be grouped with *Tiarinia* and *Macrocoeloma*, as it is by Miers (*loc. cit.*), I cannot agree, since *Tiarinia* has complete orbits and an enormously broad basal antennal joint, which *Tylocarcinus* has not.

The type of *Tylocarcinus*, namely *T. styx* (Herbst) = *Microphrys styx* A. Milne-Edwards, is placed by the latter author (Nouv. Archiv. du Mus., VIII. 1872, p. 247) between *Picrocerus* and *Criocarcinus* on the one hand and *Hyastenus* on the other; and this seems to me to be a very natural position.

Tylocarcinus styx (Herbst).

Cancer styx, Herbst, Krabben, III. iii. 53, pl. viii. fig. 6 ("nur klein").

[*Pisa styx*, Latr. Encyc., X. 141.]

Pisa styx, Milne-Edwards, Hist. Nat. Crust. I. 308.

Arctopsis styx, Adams and White, 'Samarang' Crust., p. 10; and A. Milne-Edwards, in Maillard's L'ile Reunion, Annexe F, p. 6.

Milnia styx, Stimpson, Ann. Lyc. Nat. Hist. New York, Vol. VII. 1862, p. 180.

Microphrys styx, A. Milne-Edwards in Archiv. du Mus. VIII. 1872, p. 247, pl. xi. fig. 4.

Tylocarcinus styx, Miers, Ann. Mag. Nat. Hist. 1879, Vol. IV. p. 14.

Pisa styx, Richters, Möbius, Meeresf. Maurit., p. 141.

Tylocarcinus styx, de Man, Notes Leyden Mus., Vol. III. 1881, p. 94; and Archiv. fur Naturges. LIII. 1887, p. 228; and Ortmann, Zool. Jahrb. Syst. etc. VII. 1893, p. 62; and Henderson, Trans. Linn. Soc., Zool., 1893, p. 349.

Carapace subpyriform and covered with rounded tubercles, among which the following are distinct:—two in the inter-orbital space; four in a transverse series on the front part of the gastric region, followed by three in a triangle; one in the groove between the gastric and cardiac regions, and three in a triangle on the latter region; two, side by side, on the intestinal region; and three on the posterior margin. Besides these there are several on either hepatic region, and many on the branchial regions.

The rostrum, which is between one-third and one-fourth the length of the carapace proper, consists of two divergent spines fused together at the base and slightly incurved towards the tip. The anterior angle of the supra-ocular eave is produced forwards as a sharp spine.

The chelipeds in the adult male are equal to the length of the carapace behind the bifurcation of the rostral spines: they are hardly stouter than the other legs, except as to the palm, which is short and inflated: the fingers, which are three-fourths the length of the palm, are strongly arched, and meet only at the tip.

In the female the chelipeds are not quite as long as the post-orbital portion of the carapace, are slenderer than the other legs, and have the palm slender and the fingers closely apposable throughout.

The ambulatory legs are short and stout: the first pair, which are considerably the longest, are rather longer than the carapace and rostrum: the merus and carpus in all are nodose on the dorsal surface, and the dactyli are strong and claw-like: always in the first pair, and sometimes in the succeeding pairs, the merus has a row of coarse spines along its front margin, and the carpus a single stout spine.

Herbst's figure is either a young male, or, more probably, a female. The figure given by A. Milne-Edwards (*loc. cit.*) is very correct; but I do not see how Miers, who cites this figure with affirmation, can call the chelipeds in the male slender: they are, like the other legs, stout, and the hands are distinctly massive.

In the Museum collection are specimens from Ceylon, from the Andamans, and from Mergui; as well as an adult male and female from Samoa obtained from the Museum Godeffroy.

Sub-family IV. MAIINÆ.

Eyes either (1) with orbits, which are either incomplete or complete, but are always complete enough to entirely conceal the cornea, when fully retracted, from dorsal view; or (2) but partially protected by a huge horn-like or antler-like supra-ocular spine, or by a large jagged post-ocular tooth, or by both.

The orbit in the first case is formed in one of two ways: there is always an arched supra-ocular eave, and a prominent post-ocular spine; and either the interval between the eave and the spine is filled by an intermediate spine which completes the orbital roof; or the supra-ocular eave and the post-ocular process are in close contact with one another, and with a process of the basal antennal joint below, so as to more or less complete the floor also of the orbit.

The basal antennal joint is always very broad, and either has its outer angle produced to aid in forming the floor of the orbit, or is armed distally with one or two large spines.

The external maxillipeds have the merus as wide as or much wider than the ischium, and the palp inserted at the antero-internal angle of the merus.

The rostrum is formed of two spines, which may be horizontal, semi-deflexed, or completely deflexed; in the last case the spines are usually more or less fused together.

The ambulatory legs are of no great length.

Key to the Indian genera.

Alliance 1. MAIOIDA.—Carapace either regularly pyriform or subcircular: rostral spines horizontal: orbits incomplete below; but fairly well roofed in above (1) by a supra-ocular eave, which has at least its postero-external angle produced, (2) by a post-ocular spine, and (3) by a spine intercalated between (1) and (2).	1. Supra-ocular eave and intermediate spine very prominent: eye-stalks slender and curved, with the cornea elongate and occupying a position more ventral than terminal.	i. The antennulary flagellum springs, or appears to spring, from within the orbit.........	MAIA.
		ii. The antennulary flagellum arises quite clear of the orbit................	PARAMITHRAX. [CHLORINOIDES.]
	2. Supra-ocular eave and intermediate spine distinct, but not very prominent: eye-stalks stout, with rounded corneæ which occupy a position as much terminal as ventral.	i. Carapace pyriform: rostral spines of considerable length, and with one or more accessory spines on the outer surface................	SCHIZOPHRYS.
		ii. Carapace subcircular: rostral spines simple, and so short as to hardly break the general outline of the carapace.......	CYCLAX.
Alliance 2. STENOCIONOPOIDA.—Carapace pyriform, often broadened anteriorly: the orbits either have the form of long semitubular antlers which sheathe the eye-stalk, but do not protect the eye, the cornea in retraction being protected by the base of an extremely long and prominent, isolated, post-ocular horn; or are reduced to the form of long outstanding horns similar to those of the rostrum: eye-stalks extremely long: the external maxillipeds have the external angle much produced: the rostrum consists of two long horns.	1. Orbits in the form of huge semi-tubular antlers followed by a long isolated post-ocular tooth: rostrum vertically deflexed: buccal frame much broader in front than behind.		CRIOCARCINUS.
	2. Orbits in the form of long outstanding horns similar to those of the rostrum, which is not deflexed, buccal frame quadrangular.....................		STENOCIONOPS.

Alliance 3. PERICEROIDA.— Carapace usually broadened anteriorly by the outstanding orbits: the orbits are either nearly or quite complete above and below, being formed by a strongly-arched supra-ocular eave in close contact with an excavated post-ocular lobe, a process of the basal antennal joint filling in the floor below.	1. Carapace oblong: rostrum broadly laminar, vertically or nearly vertically deflexed: orbits complete, but shallow..		MICIPPA.
	2. Carapace subcylindrical, the rostrum *along with the front part of the gastric region* vertically deflexed......		CYPHOCARCINUS.
	3. Carapace more or less pyriform: rostral spines distinct from the base, horizontal or slightly deflexed: orbits in the form of outstanding tubes which completely ensheathe the eyes.	i. Rostral spines divergent..	MACROCOELOMA.
		ii. Rostral spines parallel and closely approximated throughout their extent......... ...	TIARINIA.

Alliance I. MAIOIDA.

MAIA (Lamk.) Edw.

[*Maia*, Lamarck, Syst. Anim. sans verteb. V. 154 (*partim*).]
Maia, Latreille, Hist. Nat. Crust. VI. 87 (*partim*).
Maia, Desmarest, Consid. Gen. Crust., p. 143.
Maia, Milne-Edwards, Hist. Nat. Crust., I. 325.
Maia, Miers, Journ. Linn. Soc., Zool., Vol. XIV. 1879, p. 655.

Carapace pyriform, with the regions indistinct, the surface closely granular or spinular, and the lateral borders usually armed with large spines. The rostrum consists of two rather short, straight, divergent spines. The basal joint of the antennæ is broad, and has both the antero-external and antero-internal angle produced to form spines: the mobile portion of the antenna, which appears to spring from within the orbit, is completely exposed. The eye-stalks are long and curved, and bear the cornea chiefly on their ventral surface. The orbit is formed by a prominent supra-ocular eave which has its postero-external angle produced, by a sharp post-ocular spine, and by another spine between these two: the eyes are completely concealed from dorsal view when retracted. The external maxillipeds have the merus as broad as the ischium, the palp being attached to the antero-internal angle of the merus.

The chelipeds are slender, with cylindrical joints and styliform fingers. The ambulatory legs decrease very gradually in length: the first pair are not much longer than the carapace and rostrum: the dactyli of all are styliform.

The abdomen in both sexes consists of seven distinct segments.

Maia spinigera, de H.

Maia spinigera, de Haan, Faun. Japon. Crust., p. 93, pl. xxiv. fig. 4.
Maia spinigera, Adams and White, 'Samarang' Crustacea, p. 15.
Maia spinigera, Dana, U. S. Expl. Exped. Crust., pt. I. p. 85.
Maia spinigera, Ortmann, Zool. Jahrb. Syst. &c., VII. 1893, p. 51.

Carapace armed with long spines along the antero-lateral borders, down the median line, and in an oblique series on either branchial region joining the median to the antero-lateral series. Excluding the pre-ocular and post-ocular spines and the spines between them, there are four large spines on the antero-lateral border: and there are three large spines in an oblique series on either branchial region. In the middle line of the carapace there are in the gastric region two spines, in the anterior cardiac one, in the post-cardiac one, in the intestinal one, and on the posterior border a pair. Between these large spines the surface of the carapace is sharply, finely, and evenly granular.

The rostrum consists of two moderately divergent spines, the length of which is about one-fourth that of the carapace.

The chelipeds are smooth and very slender, and are rather shorter than the 2nd pair of trunk-legs: the latter, which are the longest of all, are about one-sixth longer than the carapace and rostrum. The merus of all the ambulatory legs has a strong spine at the distal end of its upper border: all the joints of all the ambulatory legs are covered with long hairs.

In the Museum collection is a single specimen from the coast of Beluchistán.

Maia gibba, n. sp. Plate IV. fig. 5.

Very near *Maia miersii*, Walker (J. L. S., Zool., Vol. XX. 1890, p. 113, pl. vi. figs. 1–3.

Distinguished (1) by the globose inflation of the posterior (branchiostegal) part of the closely and crisply tubercular carapace, and by the corresponding declivity of the anterior part, giving the animal a hunchbacked appearance; (2) by the absence of *large* marginal spines on the carapace.

Carapace remarkably swollen in its posterior part, where its greatest breadth is from about three-fourths (♂) to seven-eighths (♀) its extreme length with the rostrum; and closely covered with sharp piliferous tubercles, which, in the male, but hardly in the female, become spinular in the middle line and along the lateral borders.

The rostrum, which, like the anterior part of the carapace, is somewhat declivous, ends in two acute divergent hairy spines, which in the male are about one-sixth, in the female about one-eighth, the rest of the carapace in length. The eyes and orbits are just as in *M. squinado* (with specimens of which this species has been compared), only the cornea is relatively very much larger, and almost entirely ventral, in the present species, and the spine between the spine of the pre-orbital-hood and the post-orbital spine is nearly as large as either of these.

The antennæ are in all respects as in *M. squinado*, except that the basal joint is slightly narrower.

The appendages are just as in *M. squinado*—the legs being short and hairy and the chelipeds smooth and polished—with the single difference that the chelipeds are only as long as, and are much slenderer than the *fifth* pair of legs, and are therefore very much shorter than the second pair, which hardly exceed the carapace and rostrum in length.

	Male.	Female.
Length of carapace	32 millim.	41 millim.
Greatest breadth of carapace ...	25 „	35 „
Length of chelipeds	24 „	31 „
„ „ 2nd pair of trunk-limbs ...	33·5 „	46 „

Loc. Andaman Sea, 250 fms.

PARAMITHRAX, Edw.

Paramithrax, Milne-Edwards, Hist. Nat. Crust. I. 323.

Paramithrax (*Paramithrax* et *Leptomithrax*), Miers, Journ. Linn. Soc. Zool., Vol. XIV. 1879, pp. 655 and 656.

Acanthophrys (partim), A. Milne-Edwards, Ann. Soc. Ent. Fr. (4) V. 1865. p. 140.

Chlorinoides, Haswell *infra*; and Miers *infra*.

Sub-genus CHLORINOIDES, Haswell.

Chlorinoides, Haswell, P. L. S., N. S. Wales, Vol. IV. 1879, p. 442; and Ann. Mag. Nat. Hist., Vol V. 1880, p 146; and Cat. Austral. Crust., p. 17.

Chlorinoides, Miers, 'Challenger' Brachyura, p. 51.

Carapace pyriform, convex, with the regions indistinct; armed with some very large acute spines. The rostrum consists of two long slender divergent horns. The basal antennal joint is just as in *Maia*, but the mobile portion of the antenna has no connexion with the orbit. The eyes and orbits are as in *Maia*, but the supra-ocular hood has its anterior angle as well as its posterior angle produced into a spine. The external maxillipeds are as in *Maia*, as are also the ambulatory legs. The chelipeds however differ, at any rate in the male, in which sex they are stouter than any of the other legs, have the palms enlarged, and the fingers arched and meeting only at the tips, which are not excavated.

The abdomen in both sexes consists of seven distinct segments.

As Miers has pointed out ('Challenger' Brachyura, p. 52), *Chlorinoides* may be regarded as a sub-genus of *Paramithrax*, and is also closely connected with *Acanthophrys aculeatus* A. Milne-Edwards (Ann. Soc. Ent. Franc. (4) V. 1865, p. 140, pl. iv. fig. 4). According to Miers, with whom I entirely agree, if *Acanthophrys aculeatus* is the type of the genus *Acanthophrys*, then *Chlorinoides* is synonymous with *Acanthophrys*.

Paramithrax (Chlorinoides) aculeatus, (Edw).

Chorinus aculeata, Milne-Edwards, Hist. Nat. Crust. I. 316.

Chorinus aculeatus, Adams and White 'Samarang,' Crust., p. 13.

Paramithrax (Chlorinoides) aculeatus, var. *armatus*, Miers, Zool. H. M. S. 'Alert,' pp. 182 & 193, pl. xviii. fig. A.

Chlorinoides aculeatus, Miers, 'Challenger' Brachyura, p. 53.

Chorinus aculeatus, C. W. S. Aurivillius, Kongl. Sv. Vet. Akad. Handl., Bd. XXIII. No. 4, p. 38, pl. ii. fig. 7.

Chlorinoides aculeatus, Henderson, Trans. Linn. Soc., Zool., 1893, p. 345.

Carapace pyriform, convex, smooth, armed with five huge thorn-like spines down the middle line, and with two even larger spines on the branchial region: there are also, on either pterygostomian region, two oblique crests, the anterior with three or four teeth—two of which are visible in a dorsal view — the posterior with one or two.

The rostrum consists of two large divergent horns, the length of which is considerably more than half that of the carapace proper.

The orbit consists of a supra-ocular hood, the angles of which (especially the anterior) are strongly produced, of a bilobed post-ocular tooth, and of a long spine filling the interval between the two, just as in *Maia spinigera*. The basal antennal joint, as in most of the forms included in this group, has a strong spine at its antero-external, and another at its antero-internal angle.

The chelipeds in the female are slender, and are only equal to the post-rostral portion of the carapace in length: as in the male, the merus has its crest-like upper and lower edges sharply scallopped and the carpus is cristate above. In the male the chelipeds are stouter than the other legs, especially as to the palm, which is considerably enlarged. The ambulatory legs decrease gradually in length from the 1st pair, which are equal in length to the carapace *plus* two-thirds of the rostrum: the merus in the first two pairs has a very strong spine at the distal end of its upper border; but this in the case of the last two pairs is often reduced to a tubercle.

The body and legs in this species are somewhat hairy and are more or less encrusted with sponges, zoophytes, polyzoa, etc.

In the Museum collection are specimens from the Arakan Coast, Mergui, and Ceylon.

Paramithrax (*Chlorinoides*) *longispinus* (de Haan).

Maja (Chorinus) longispina, de Haan, Faun. Japon., Crust., p. 94, pl. xxiii. fig. 2.

Chorinus longispina, Adams and White, 'Samarang' Crust., p. 12.

Paramithrax (Chlorinoides) longispinus, Miers, Zoology H. M. S. 'Alert,' pp. 517 and 522.

Chlorinoides longispinus, Miers, 'Challenger' Brachyura, p. 53.

Chlorinoides longispinus, A. Ortmann, Zool. Jahrb. Syst., etc., VII. 1893, p. 53.

This species differs from *P. aculeatus* in the following constant characters:—

(1) it is a much smaller species;

(2) all the spines, including the rostral spines, are elegantly knobbed at tip;

(3) in the median line of spines the third—the one on the cardiac region—is cleft transversely into two from the base;

(4) the two oblique dentate ridges on the pterygostomian region are present, but the outermost tooth on the front ridge is produced to form a long spine;

(5) the spine at the anterior angle of the supra-ocular hood is similar in size, form, and direction to the other large spines of the carapace;

(6) the rostral spines are less than half the length of the carapace;

(7) the antero-external angle of the basal antennal joint is produced to form, not a spine, but an elegantly curved foliaceous lobe;

(8) the meropodites of all the ambulatory legs have the terminal spine distinct and knobbed at the tip.

This species commonly encrusts itself with a very regular plate-armour of Orbitolites and rounded fragments of Nullipore, etc.

In the Museum collection are good series from off Ceylon 33–34 fathoms, from the Andaman Sea down to 41 fathoms, and from the Madras Coast.

SCHIZOPHRYS, White.

Schizophrys, White, Ann. Mag. Nat. Hist., Vol. II. 1848, p. 282.

Schizophrys, Miers, Journ. Linn. Soc., Zool., Vol. XIV. 1879, p. 660 (*et synon.*); and 'Challenger' Brachyura, p. 66.

Dione, de Haan, Faun. Japon. Crust., p. 82.

Carapace broadly pyriform, with the surface granular and the lateral margins strongly spinate. The rostrum consists of two short stout slightly incurved spines, the outer border of which carries one or two accessory spines. The orbit is formed by a little-prominent supra-ocular eave, and a sharply bilobed post-ocular tooth, with a broad spine in the interval between the two: the eye-stalks are stout and the cornea terminal, not ventral, in position. The basal antennal joint is somewhat narrowed anteriorly, and ends in two sharp spines—as in the genera immediately preceding: the mobile portion of the antenna is freely exposed. In the external maxillipeds the merus is rather broader than the ischium, and the palp is attached to the antero-internal angle of the merus.

The chelipeds have the merus and carpus granular or spiny; the palm long, smooth and slender; and the fingers longitudinally channelled in their distal half—this being specially marked in the adult male, in which also the chelipeds are longer and stouter than the other legs.

The ambulatory legs are stout, have cylindrical joints, and decrease gradually in length.

The abdomen in both sexes consists of seven distinct segments.

Schizophrys aspera, (Edw.)

Mithrax asper, Milne-Edwards, Hist. Nat. Crust., I. 320; and Dana, U. S. Expl. Exp. Crust., pt. I. p. 97, pl. ii. figs. 4 *a*–*b*.

Schizophrys aspera, A. Milne-Edwards, Nouv. Archiv. du Mus. VIII. 1872, p. 231, pl. x. fig. 1; and Haswell, Proc. Linn. Soc., N. S. Wales, Vol. IV. 1879, p. 447; and Cat. Austr. Crust., p. 22; and Miers, Zool. H.M.S. 'Alert,' pp. 182 and 197, and 'Challenger' Brachyura, p. 67; and De Man, Archiv. fur Naturgesch., LIII. 1887, p. 226, and Journ. Linn. Soc., Zool., Vol. XXII. 1888, p. 20; and C. W. S. Aurivillius, Kongl. Sv. Vet. Akad., Handl. XXIII. 1888-89, No. 4, p. 51; [and Cano, Boll. Soc. Nat., Napol., III. 1889, p. 179]; and A. O. Walker, Journ. Linn. Soc., Zool., Vol. XX. 1890, pp. 109 and 113; and Ortmann, Zool. Jahrb. Syst., etc., VII. 1893, p. 57; and J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 346; and Mary J. Rathbun, Proc. U. S. Nat. Mus., Vol. XVI. 1893, p. 91.

Schizophrys serratus, White, P. Z. S., 1847, p. 223, fig.; and Ann. Mag. Nat. Hist., Vol II. 1848, p. 283, fig.; and Adams and White, 'Samarang' Crust., p. 16.

Schizophrys spiniger, White, *ll. cit.*; and Adams and White *loc. cit.*; and ? Kossmann, Reise Roth. Meer., Crust., p. 15.

Maja (*Dione*) *affinis*, de Haan Faun. Japon. Crust., p. 94, pl. xxii. fig. 4; and Adams and White, 'Samarang' Crust., p. 15; and Stimpson, Proc. Ac. Nat. Sci., Philad., 1857, p. 218.

Mithrax spinifrons, A. Milne-Edwards, Ann. Soc. Ent., France, (4) VII. 1867, p. 263.

Mithrax affinis, F. de B. Capello, Jorn. Sci., Lisb., 1870-71, p. 264, pl. iii. figs. 4, 4*a*.

Mithrax (*Schizophrys*) *affinis*, *triangularis* (et varr. *excipe var.* dichotoma) Kossmann, Reise Roth. Meer., Crust., pp. 11 and 13; and *Schizophrys triangularis* var. *indica*, Richters, Möbius, Meeresf. Maurit., p. 143, pl. xv. figs. 8–14.

Carapace pyriform, its greatest breadth about $\frac{9}{10}$ its length behind the point of bifurcation of the rostral spines, its surface closely and unevenly granular, with scattered sharp tubercles in addition. Exclusive of the large unequally-bifid post-ocular spine, the antero-lateral border is armed with six equidistant spines, the last of which is the smallest and is situated on a rather higher level than the others: the posterior border proper is generally beaded, and has its angles produced and upturned.

The rostrum consists of two stout parallel or incurved spines, the length of which is from one-fifth to one-sixth that of the carapace proper, and the outer border of each of which carries a strong accessory spine.

The basal antennal joint ends in two stout spines, and there is a spine on the sub-hepatic region outside the angle of the buccal frame, and a sharp denticle in the middle of the inferior border of the orbit.

The chelipeds vary: in both sexes the palm is long—twice the length of the fingers—smooth, polished, and either quite unarmed, or armed, at the near end of the upper border, with a spine or with two or three denticles; and in both sexes the merus and carpus are either spiny or granular.

But whereas in old males the chelipeds are stouter than any of other legs, are more than half again as long as the carapace and rostrum and nearly half again as long as the 2nd pair of legs, and have deeply channelled fingers that meet in less than their distal half; in females and young males they are not stouter than the other legs, are not quite equal in length to the carapace and rostrum or to the second pair of legs, and have the fingers less deeply channelled, and apposable in at least half their extent.

The ambulatory legs decrease very gradually in length: they have short claw-like dactyli, and the merus is armed at the far end of the upper border with a spine or tubercle. The body and legs are hairy, and the animal frequently protects itself with flat pieces of Nullipore, &c.

In the collection is a large series of specimens from all parts of the Indian coast, from Mergui and Tavoy on the East to Karáchi on the West.

Schizophrys dama, (Herbst.)

Cancer dama, Herbst, Krabben, III. iv. p. 5, tab. lix. fig. 5.

Mithrax dama, Milne-Edwards, Hist. Nat. Crust., I. 319.

Mithrax (Schizophrys) dama, Kossmann, Reise Roth. Meer., Crust., pp. 11 and 13.

This species differs constantly from *Schizophrys aspera* in the following particulars :—

(1) the carapace is much more elongate, its greatest breadth being only about $\frac{3}{4}$ its length behind the point of bifurcation of the rostral spines ;

(2) the rostrum is rather longer, and has *two* accessory spines on its outer border ;

(3) there is no (ventral) spine on the sub-hepatic region ;

(4) the surface of the carapace is more closely and evenly, but more bluntly, granular.

The specimens in the Museum collection come from the Straits of Malacca.

CYCLAX, Dana.

Cyclax, Dana, U. S. Expl. Exp., Crust., pt. I. p. 99.

Cyclomaia, Stimpson, Amer. Journ. Sci. and Arts, Vol. XXIX. 1860, p. 133 ; and A. Milne-Edwards, Nouv. Archiv. du Mus., VIII. 1872, p. 235 (*et synon.*)

Cyclax (*Cyclax* and *Cyclomaia*), Miers, Journ. Linn. Soc., Zool., Vol. XIV. 1879, p. 660.

This genus differs from *Schizophrys*, from which, perhaps, it ought not to be separated, only in the form of the carapace, and in the degradation and shortening of the rostrum, with which is correlated a shortening and broadening of the basal antennal joint. (In one species the legs are slender). The carapace is subcircular ; the rostrum obsolescent and bifid ; the basal antennal joint very short and broad, and armed with a third spine—a very small one, situated on the outer margin.

Cyclax (Cyclomaia) suborbicularis, (Stimpson).

Mithrax suborbicularis, Stimpson, Proc. Ac. Nat. Sci., Philad., 1857, p. 218.

Cyclax spinicinctus, Heller, Crust. Roth. Meer, in SB. Ak., Wien, XLIII. i. 1861, p. 304, tab. i. figs. 7-8 : and Richters, in Möbius, Meeresfauna Maurit., p 144.

Cyclomaia margaritata, A. Milne-Edwards, Nouv. Archiv. du Mus., VIII. 1872, p. 236, pl. x. figs. 2-3 ; and Haswell, P. L. S., N. S. Wales, Vol. IV. 1879, [p. 441, and Cat. Austral. Crust., p. 21.

Cyclomaia suborbicularis, Ortmann. Zool. Jahrb., Syst., etc., VII. 1893, p. 58.

[*Cyclomaia margaritata*, F. Muller, Verh. Ges., Basel, VIII. p. 473.]

Carapace subcircular, its surface closely beaded, with some larger spinules regularly interspersed : the lateral margin is armed with six large spines (exclusive of the large curved unequally-bifid post-ocular spine) the first of which is often bifid: close to the posterior margin, in the middle line, is a pair of smaller spines.

The rostrum consists of two triangular teeth, which although broader are not longer than the spines of the lateral margin.

The eyes are of moderate length and are retractile into orbits formed, as in *Schizophrys*, *Maia*, etc., of a supra-ocular eave, a large post-ocular spine, with another spine in the interval between the two: the supra-ocular eave has its angles slightly produced and spiniform.

The broad short basal antennal joint ends in two stout teeth, and has a third denticle on its outer margin.

The chelipeds in the female and young male are slightly more slender than the other legs, and are as long as the carapace or as the 2nd pair of trunk-legs *minus* the dactylus: they have a long slender smooth palm, nearly twice the length of the fingers. The ambulatory legs are hairy, have short claw-like dactyli, and decrease gradually in length.

In the Museum collection are specimens from the Madras coast and from the Andamans.

Alliance II. STENOCIONOPOIDA.

CRIOCARCINUS, Edw.

Criocarcinus, Milne-Edwards, Hist. Nat. Crust., I. 331.
Criocarcinus, Miers, Journ. Linn. Soc., Zool., Vol. XVI. 1879, p. 661.

Carapace shaped and armed much as in *Chlorinoides*, but with the hepatic regions concave as in *Micippe*. The rostrum consists of two curved almost vertically deflexed spines, which are fused together in their basal half. The eye-stalks are slender and of extreme length. The orbit is formed of a semi-tubular branching supra-ocular hood which encloses the eye-stalk, and of a long slender post-ocular spine, against the base of which the eye is retractile: the supra-ocular hoods have the appearance of a pair of antlers. The basal antennal joint is broad, and has a strong spine at either anterior angle: the mobile portion of the antenna is freely exposed.

The buccal frame is narrow behind and broad in front, as in *Micippe*; and the merus of the external maxillipeds is broader than the ischium, and carries the palp at its deeply-notched internal angle.

The chelipeds are shorter, and in the male somewhat stouter but in the female somewhat slenderer, than the other trunk-legs, which again are of no great length and decrease gradually from the 2nd pair.

The abdomen consists of seven distinct segments in the male, of five in the female.

Criocarcinus superciliosus (Herbst), Guérin, Edw.

Seba, III. xviii. 11: Linnæus, Syst. Nat., I. 2, 1047, No. 45.

Cancer superciliosus, Herbst, Krabben, I. ii. 227, tab. xiv. fig. 89.

Criocarcinus superciliosus, Guérin, Voy. Coquille, Zool., Vol. II. Crust., p. 19.

Criocarcinus superciliosus, Milne-Edwards, Hist. Nat. Crust., I. 332.

Criocarcinus superciliosus, A. Milne-Edwards, Nouv. Archiv. du Mus., VIII. 1872, p. 242, pl. xii. fig. 3.

Criocarcinus superciliosus, Kossmann, Reise Roth. Meer., Crust., p. 10, tab. iii. fig. 6 (*vide synon*).

Carapace pyriform, broadened anteriorly by the antler-like "orbits," with the hepatic regions sunken, and the other regions fairly distinct: in addition to numerous pearly tubercles, which are tufted with curly bristles, the carapace is armed with several large knob-tipped spines, namely two in the middle line on the gastric region, one in the middle line on the posterior border, one on either side near the boundary of the hepatic and branchial regions, and one, directed obliquely backwards, near the middle of either branchial region.

The rostrum consists of two vertically deflexed spines, the bases of which are broadened and fused together, and the points of which are divergent and elegantly curved.

The eyes and orbits have already been described in a general way: the long semi-tubular supra-ocular hood ends in three diverging tines, and the long post-ocular spine has its anterior border armed with two or three denticles.

The external maxillipeds have the outer edge thin and sharp, the outer edge of the ischium being emarginate, and the outer angle of the merus being produced.

The chelipeds are shorter than the other trunk-legs, and are about as long as the carapace behind the level of the post-ocular spine. In the male they are slightly stouter than the other legs, and have the palm a little swollen: in the female they are slenderer than the other legs, and have the palm slender and a little tapering.

Of the ambulatory legs, which are hairy, the first two pairs are slightly the longest, both being rather less than one-third longer than the post-rostral portion of the carapace: the last two pairs are not much shorter.

In the Museum collection are specimens from the Andaman Islands.

STENOCIONOPS, Latr.

[*Stenocionops*, Latreille, R. A., (2) IV. 59.]

Stenocionops, Milne-Edwards, Hist. Nat. Crust., I. 337.

"Carapace narrow, uneven, and armed posteriorly with a large triangular prolongation which covers the base of the abdomen. The rostrum is formed of two styliform divergent horns. The supra-ocular border is armed with a horn similar to those of the rostrum, but directed more obliquely. The eye-stalks are slender, immobile and extremely salient; their length is half the greatest breadth of the body. The first joint of the antennæ is much longer than broad, the second is slender and is inserted beneath the rostrum.

The epistome is nearly square, and the external maxillipeds have the merus extremely dilated at the antero-external angle, and excavated at the antero-internal angle. The trunk-legs, in the female, are slender and cylindrical: those of the first pair (chelipeds) are hardly stouter and are much shorter than the second, which latter are a little longer than the carapace and rostrum: the others diminish very gradually in length: all the ambulatory legs have sharp, recurved dactyli. The abdomen of the female consists of five segments, the 4th, 5th and 6th segments being fused together." (Edw.)

Stenocionops cervicornis (Herbst).

Cancer cervicornis, Herbst, Krabben, III. iii. 49, pl. lviii. fig. 2.

[*Stenocionops cervicornis*, Guérin, Icon. Regne An., Crust., pl. 8 bis, fig. 3].

Stenocionops cervicornis, Milne-Edwards, Hist. Nat. Crust., I. 338.

Stenocionops cervicornis, Cuvier, Regne Animal, Crust., pl. xxxi. fig. 1.

Stenocionops cervicornis, and ? *curvirostris*, A. Milne-Edwards, Ann. Soc. Ent., France, (4) V. 1865, p. 135 (pl. v. figs. 1-1*e*.)

Stenocionops cervicornis, E. Martens, Verh. zool. bot. Ges., Wien, XVI. 1866, p. 379.

[*Stenocionops cervicornis*, Cano, Boll. Soc. Nat., Napol., III. 1889, p. 177.]

Stenocionops cervicornis, Henderson, Trans. Linn. Soc., Zool., 1893, p. 343.

"Carapace uneven and tuberculated: rostral and supra-ocular horns slender, very long, and nearly co-equal: two large conical elevations on the sides of either hepatic region: antennæ shorter than the rostrum: chelæ finely toothed and a little incurved: legs smooth." (Edw.)

Alliance III. PERICEROIDA.

MICIPPA, Leach.

Micippa, Leach, Zool. Miscell., III. p. 16.

Micippe, Desmarest, Consid. Gen. Crust., p. 148.

Micippe, Milne-Edwards, Hist. Nat. Crust., I. 329.

Micippa, Miers, Journ. Linn. Soc., Zool., Vol. XIV. 1879, p. 661; Ann. Mag. Nat. Hist., Vol. XV. 1885, p. 3; and 'Challenger' Brachyura, p. 69.

Carapace nearly oblong, depressed, rounded behind, broadened anteriorly, and ending at a broad, lamellar, more or less vertically deflexed rostrum, the tip of which is cleft or emarginate. The eyestalks are long, and the corneæ, which are rather ventral than terminal in position, can be completely retracted from dorsal and usually also from ventral view. The orbit is formed by a sharply-arched supra-ocular eave, which is in contact either with an excavated post-ocular spine or with an intercalated spine as in *Maia*, and is partly or entirely completed below and in front by a process of the broad basal antennal joint. The mobile portion of the antenna is completely exposed.

The buccal frame is broadened in front: the merus of the external maxillipeds is broader than the ischium, and has its external angle expanded and its internal angle notched for the insertion of the palp.

The chelipeds in the adult male are as long as or a little longer than the carapace, are a little stouter than the other legs, and have the palm broader than the other joints, and the fingers arched to meet only at the tip. The chelipeds in the female are slenderer than the other legs, are about the same length as the carapace, and have slender palms and almost straight fingers. The ambulatory legs are moderately elongate, subcylindrical, and have the dactyli not much or not at all shorter than the propodites.

Abdomen, in both sexes, seven-jointed.

Key to the Indian species of Micippa.

I. Rostrum very broad, ending in four sharp lobes or spines (*i.e*, each lobe of the rostrum bilobed)......................	*M. philyra.*
II. Rostrum moderately broad, ending in two long sharp lobes or spines (*i.e.*, each lobe of the rostrum simple), not inflexed at tip..	*M. thalia.*
III. Rostrum moderately broad, inflexed at tip; ending in two insignificant blunt lobes, each of which has a small tooth at its external angle:—	
1. Three large pearl-like tubercles embedded in the posterior margin........................	*M. margaritifera.*
2. Two small pearl-like tubercles embedded in the posterior margin, with a group of small spinules between them...............	*M. margaritifera* var. *parca.*

Micippa philyra, (Herbst.) Leach.

Cancer philyra, Herbst, Krabben, III. iii. p. 51, pl. lviii. fig. 4.

Micippa philyra, Leach, Zool. Miscell., III. 16; and Desmarest, Consid. Gen. Crust., p. 149, pl. xxii. fig. 2; and Guérin, Icon. R. A., pl. viii bis, fig. 1; and Milne-Edwards, Hist. Nat. Crust., I. 330; and Adams and White, 'Samarang' Crust., p. 15; and A. Milne-Edwards, Nouv. Archiv. du Mus., VIII. 1872, p. 239, pl. xi. fig. 2 and KOSSMANN, REISE ROTH. MEER., CRUST., p. 6 (*ubi synon.*); and varr. *platipes* and *mascarenica*, pl. iii. figs. 2-3; and Richters, Möbius, Meeresfauna, Mauritius, p. 143, pl. xv. figs. 6-7, and var. *latifrons*, p. 142, pl. xv. figs. 1-5; and Lenz and Richters, Abh. senck. Ges. XII. 1881, p. 421; and Miers, Zoology H. M. S. 'Alert,' pp. 182 and 198, and Ann. Mag. Nat. Hist., 1885, Vol. XV. p. 6, and 'Challenger' Brachyura, p. 69; and Ortmann, Zool. Jahrb. Syst., &c., VII. 1893, p. 59; and J. R. Henderson, Trans. Linn. Soc., Zool., 1893, p. 348.

Micippe platipes, Rüppell, Beschrib. und Abbild., 24 Krabben Roth. Meer., Frankfort, 1830, p. 8, tab. i. fig. 4; and Milne-Edwards, Hist. Nat. Crust., I. 333 (*Paramicippe*); and Heller, Crust. Roth. Meer., SB. Ak., Wien, XLIII. 1861, p. 299, tab. i. fig. 2; and De Man, Archiv. fur Naturgesch., LIII. 1887, p. 227 (*Paramicippe*).

Micippe bicarinata, Adams and White, 'Samarang' Crust., p. 16, (*sec.* Kossmann and Miers).

? *Micippe hirtipes*, Dana, U. S. Expl. Exp., Crust., pt. I. p. 90, pl. i. figs. 4 *a–e*; and Stimpson, Proc. Ac. Nat. Sci., Philad., 1857, p. 218; and Heller, Reise 'Novara,' Crust., p. 3.

Micippa spatulifrons, A. Milne-Edwards, Nouv. Archiv. du Mus., VIII. 1872, p. 240, pl. xi. fig. 3; and Haswell, Proc. Linn. Soc., N. S. Wales, Vol. IV. 1879, p. 445, and Cat. Austral. Crust., p. 24.

Micippa mascarenica, Kossm., Miers, Ann. Mag. Nat. Hist., 1885, Vol. XV. p. 7, and 'Challenger' Brachyura, p. 69; and A. O. Walker, Journ. Linn. Soc., Zool., Vol. XX. 1890, p. 109; and J. R. Henderson, Trans. Linn. Soc., Zool., 1893, p. 348.

Micippa superciliosa, Haswell, Proc. Linn. Soc., N. S. Wales, Vol. IV. 1879, p. 446, pl. xxvi. fig. 2, and Cat. Austral. Crust., p. 25.

Paramicippa asperimanus, Miers, Zoology H. M. S. 'Alert,' pp. 517 and 525.

Body and ambulatory legs closely covered by a woolly tomentum. Carapace with the regions well defined by smooth sulci, the hepatic regions sunken and pinched in, the surface closely and unevenly granular: the lateral margins are armed with knob-tipped spinules, of which there are sometimes as many as six, sometimes as few as two, on either side.

The rostrum consists of a broad lamina which in the female is quite vertically, but in males is not so much deflexed, its sides are gently sinuous, and it ends in four sharp-cut lobes. The eyes are completely retractile within the orbits.

The basal antennal joint is short and is extremely broad anteriorly, its greatly produced antero-external angle completing the orbit below and in front. The mobile portion of the antenna, which is freely exposed, varies in length and in the form of the flattened 2nd joint of the peduncle. In some males (var. *mascarenica*) the mobile portion of the antenna is half the length of the horizontal portion of the carapace, and the length of the 2nd joint is rather more than one-third the breadth of the rostrum at its own point of origin. But in all ovigerous females, and in certain males, the mobile portion of the antenna is between one-third and one-fourth the length of the horizontal portion of the carapace, and the length of the 2nd joint is less than one-third the breadth of the rostrum at its own point of origin—the joint also being somewhat broadened.

The chelipeds also vary. In certain males, both adult and young (var. *mascarenica* partim), they are stouter than the other legs, are very variably granular, are a little longer than the carapace, have the hand very variably broadened and inflated, and the fingers closely apposable only at tip. In all females they are a little shorter than the carapace, are quite smooth, are rather slenderer than the other legs, and have slender palms, and fingers that are closely apposable in the greater part of their extent. In certain other adult males they are intermediate in condition, approaching more to the female type.

The ambulatory legs are moderately stout and are hairy: the 1st pair, which are the longest, are rather longer than the chelipeds; the others decrease gradually in length.

Miers' valuable paper, Ann. Mag. Nat. Hist., 1885, Vol. XV. pp. 6–8 should be consulted. After examining over forty specimens from the Andamans I adhere to Kossmann's synonomy and opinion (*loc. cit.*)

The characters upon which the separation of *M. mascarenica* from *M. philyra* is based are all variable; and I think that we have here to deal with a case of male dimorphism, such as is known to occur in certain Beetles, where one form of male is aberrant from the female type while another form of male resembles the female in certain particulars: *vide* Bateson and Brindley, Variation in Secondary Sexual Characters, P.Z.S., 1892, p. 585.

Micippa thalia, Herbst.

Cancer thalia, Herbst, Krabben, III. iii. 50, tab. lviii. fig. 3.

Micippa thalia, Gerstäcker, Archiv. fur Naturgesch, XXII. 1856, p. 109; and Adams and White, 'Samarang' Crust., p. 15; and A. Milne-Edwards, Nouv. Archiv. du Mus., VIII. 1872, p. 238, pl. xi. fig. 1; and Kossmann, Reise Roth. Meer., Crust., p. 8 (*et varr.*); and MIERS, Zoology H. M. S. 'Alert,' pp. 182 & 198, and ANN. MAG. NAT. HIST., 1885, VOL. XV. p. 10 (*ubi synon.*), and 'Challenger' Brachyura, p. 70; and [Cano, Boll. Soc. Nat., Napol., III. 1889, p. 179]; and Ortmann, Zool. Jahrb. Syst., etc., VII. 1893, p. 60; and Henderson, Trans. Linn. Soc., Zool., 1893, p. 348.

Micippa thalia (= var. *aculeata*), de Haan, Faun. Japon. Crust., p. 98, pl. xxiii. fig. 3; and Krauss, Südafr. Crust., p. 51; and Bianconi, Mem. Ac., Bologna, III., 1851, p. 103, pl. x. fig. 2; and Kossmann, Reise Roth. Meer., Crust., pp. 5 and 8, pl. iii. fig. 5; and Hilgendorf, MB. Akad., Berl., 1878, p. 786; and Richters, Möbius, Meeresfauna, Maurit., p. 142; and Miers, Ann. Mag. Nat. Hist., 1885, Vol. XV. p. 11 (*ubi synon.*); and De Man, Journ. Linn. Soc., Zool., Vol. XXII. 1888, p. 20; and Mary J. Rathbun, Proc. U. S. Nat. Mus., Vol. XVI. 1893, p. 92.

Micippe miliaris, Gerstäcker, Archiv. fur Naturges., XXII. 1856, p. 110; and Heller, Crust. Roth. Meer., SB. Ak., Wien, XLIII. 1861, p. 298, pl. i. fig. 1; and Kossmann, Reise Roth. Meer., Crust., pp. 4 and 8; and Miers, Ann. Mag. Nat. Hist., 1885, Vol. XV., p. 11.

Micippa haanii, Stimpson, Proc. Ac. Nat. Sci., Philad., 1857, p. 217; and Miers, Zool. H. M. S. 'Alert,' pp. 517 and 524; and C. W. S. Aurivillius, Kongl. Sv. Vet. Ak. Handl., XXIII. 1888–89, No. 4, p. 52, pl. iv. figs. 1, 1*a*; and de Man, J. L. S., Zool., Vol. XXII. 1888, p. 20.

Micippe pusilla, Bianconi, Mem. Ac. Sci., Bologna, 1869, Vol. IX. p. 205, pl. i. fig. 1: and Hilgendorf, MB. Ak., Berl., 1878, p. 787.

Micippa inermis, Haswell, P. L. S., N. S. Wales, Vol. IV. 1879, p. 445, pl. xxvi. fig. 3, and Cat. Austral. Crust., p. 24.

Body and ambulatory legs covered with a woolly tomentum.

Carapace with the regions fairly well-defined, the hepatic regions depressed, and the surface closely and evenly granular. From the granular surface there usually, but not always, arise several large vertical spines, which are typically disposed as follows:—one on either supra-ocular hood, two on the gastric region in the middle line, and two placed obliquely on either branchial region. Any or all of these spines may be suppressed. The lateral margins are armed with an irregular series of spines or spinules, and a few spinules may exist on the posterior border in the middle line.

The rostrum is deflexed nearly vertically in the adult female, less vertically in the adult male, and at an angle of 45° or less in the young male: it ends in two curved divergent spines.

The basal antennal joint is produced at its antero-external angle to assist in the formation of the floor of the orbit, but there is a wide hiatus between this process and the post-ocular spine, so that the floor of the orbit is incomplete.

The chelipeds in the adult male are as long as the carapace, are not much stouter than the other legs, and have slender palms, and long slender fingers which, though nearly straight, are closely apposable only in their distal half. In the adult female the chelipeds are equal in length to the post-orbital portion of the carapace, are slenderer than the other legs, and have tapering palms and minute fingers. The merus and carpus of the ambulatory legs are sometimes swollen.

In the Museum collection are specimens, representing all the varieties of this species, from Mergui, Burma, Orissa and Malabar, as well as from Hongkong and Nagasaki.

This species shows quite as well as *M. cristata* the close relation of *Micippa* to *Maia*.

Micippa margaritifera, Henderson.

Micippa margaritifera, Henderson, Trans. Linn. Soc., Zool., 1893, p. 348, pl. xxxvi. figs. 5–7.

Carapace symmetrically sculptured, closely crisply and finely granular, and with the hepatic regions deeply excavate: there are three coarse spinules, disposed in a triangle base outwards, on either branchial region, and a denticle at the anterior boundary of the branchial region; and on the posterior margin are three smooth polished globules "exactly resembling pearls" inset.

The rostrum is long, vertically deflexed in both sexes, and incurved at the tip, which ends in two shallow lobes—the outer angle of each lobe being marked by a spinule.

The basal antennal joint has its antero-external portion greatly produced to complete the floor of the orbit.

The chelipeds in the male are a little longer than the carapace, and have the palms broadened and inflated, and the fingers closely apposable only at the tip. In the female the chelipeds are very much slenderer than the other legs, are only as long as the post-orbital portion of the carapace, and have the hand very slender and tapering. The ambulatory legs are remarkable for their large obtriangular foliaceous meropodites, which in the first pair are specially remarkable, as they are closely apposable to the front, to form, as in *Calappa*, a shield.

In the Museum collection are specimens from both sexes from the Andamans, from Ceylon (34 fms.), and from the Maldives (20–30 fms.).

Micippa margaritifera, var. *parca* nov. I distinguish, provisionally, as a variety, two ovigerous females from the Andamans, in which the middle "pearl" on the posterior border is replaced by a group of spinules, and in which the meropodites of the ambulatory legs are even more broadly foliaceous.

CYPHOCARCINUS, A. M.-Edw.

Cyphocarcinus, A. Milne-Edwards, Nouv. Archiv. du Mus., IV. 1868, p. 73; and Miers, Journ. Linn. Soc., Zool., XIV. 1879, p. 664.

Carapace elongate, subcylindrical, with the gastric region greatly elevated; *the anterior part of the gastric region, along with the front, being vertically deflexed*. The rostrum is formed of two little horns, *each* of which is sharply bifurcate at the tip, one branch being directed forwards and outwards, the other being recurved upwards. The eyes are small and are sunk in small tubular orbits formed in the typical Periceroid manner. The antennæ are small: the basal joint has its antero external angle separated from the rest of the joint by a deep cleft. The external maxillipeds have the merus dilated at both the internal and external anterior angles. The chelipeds in the female are not longer than the 2nd pair of legs and are hardly stouter. The ambulatory legs have the dactylus recurved, strongly spinate along the posterior edge—prehensile. The sternum in the female forms a hollow, the mouth of which is completely closed by the broad and perfectly flat abdomen.

? *Cyphocarcinus minutus*, A. M.-Edw.

Cyphocarcinus minutus, A. Milne-Edwards, *loc. cit.* pl. xix. figs. 7-12.

Carapace elongate, subcylindrical, the lateral borders nearly parallel in their posterior two-thirds, gently convergent anteriorly. Besides the greatly elevated and anteriorly deflexed gastric region, there are two or three slight bulgings on the side of either branchial region, a slight elevation on the cardiac region, and a median prolongation—overlapping the abdomen—of the posterior border. The hepatic regions are very small and are not visible from the dorsal aspect. The supra-orbital border bears one or two little teeth. The second joint of the antennal peduncle is much enlarged, the third is clavate, and the flagellum is hardly to be distinguished from the hairs on the third joint. The chelipeds in the female are smooth, but the legs are hairy and have the joints, especially the merus, somewhat broadened. Two adult females, one from the Pedro Shoal, the other from the Andamans, are in the Museum collection. The larger of the two is 10 millim. long and has the carapace deeply encrusted by a colony of calcareous Polyzoa.

MACROCŒLOMA, Miers.

Macrocœloma, Miers, Journ. Linn. Soc., Zool., Vol. XIV. 1879, p. 665; and 'Challenger' Brachyura, p. 79.

Entomonyx, Miers, Zoology H. M. S. 'Alert,' p. 525.

Carapace subpyriform, but broadened anteriorly by the projecting orbits: the dorsal surface unarmed, or tuberculated, or with a few long spines: the margins without a series of elongated lateral spines, but often with a strongly developed lateral epibranchial spine, preceded by some smaller spines. The spines of the rostrum are well developed. The eyes are retractile within roomy projecting tubular orbits, which are formed much as in *Micippa*.

The antennæ have the basal joint considerably enlarged and armed distally with one or two spines. The mobile portion of the antenna is sometimes concealed by the rostrum, sometimes exposed. The merus of the external maxillipeds is broader than the ischium, and notched at the internal angle for the insertion of the palp.

The chelipeds in the male have the palms enlarged, and the fingers either arched and meeting only at the tip, or not. The ambulatory legs are rather short.

This genus might, without any unnatural stretch, be included with *Micippoides*, A. M.-Edw. (Journ. Mus. Godeffr. I., Crust., p. 254).

Macrocoeloma nummifer, n. sp., Plate IV. fig. 4.

Closely allied to *Macrocoeloma concava*, Miers, 'Challenger' Brachyura, p. 81, pl. x. fig. 2; and to *Entomonyx spinosus*, Miers, Zoology H. M. S. 'Alert,' p. 526, pl. xlvii. fig. B.

Carapace rather more than $\frac{1}{4}$ longer than broad, with the regions well-defined: its surface is regularly and sharply tubercular and is armed with two sharp spines—one behind the other—on the gastric region, two larger—side by side—on the cardiac region, two still larger—one obliquely behind the other—on the lateral epibranchial region, and two very small ones—one behind the other—on the intestinal region.

The rostrum consists of two straight sharp slightly diverging spines, which are about one-fifth or one-sixth the length of the carapace proper, and which in the male are slightly deflexed, but in the female are strongly deflexed.

The basal joint of the antennæ is broadly obtriangular; its antero-external angle is produced to aid in forming the floor of the orbit—this orbital process having its free margin deeply excised; its antero-internal angle carries a stout vertically directed tooth. The orbits, which are in the form of large deep projecting tubes with jagged lips, are constituted as in *Micippa*.

The chelipeds are closely and sharply granular as far as the fingers: in the male they are much stouter than the other legs, are nearly as long as the carapace and rostrum, and have large broad palms, and strongly arched fingers that meet only at the tip. In the female the chelipeds, although not much shorter than those of the male, are hardly stouter than the other legs, and have fingers that can be closely apposed throughout their extent.

The ambulatory legs are slender: in all the meropodite has its posterior margin minutely spinulose, and has a spine on the far end of the upper margin: the first pair, which are the longest, are a little longer than the chelipeds.

The rostrum carapace and legs are beset with stiff curly hairs.

The abdomen in both sexes consists of seven distinct segments.

This species commonly encrusts itself with a plate armour of Orbitolites, rounded fragments of Nullipore, &c.

Loc. Andaman Sea, 17–36 fms. Off Ceylon 34 fms.

	Male.	Adult female.
Greatest length	21 millim.	21 millim.
" breadth	14 "	16 "
Length of chelipeds	19 "	15 "

TIARINIA, Dana.

Tiarinia, Dana, U. S. Expl. Exp., Crust., pt. I. p. 109.

Tiarinia, Miers, Journ. Linn. Soc., Zool., Vol. XIV. 1879, p. 664.

Carapace subpyriform, somewhat broadened anteriorly, tuberculated, terminating in a rostrum composed of two moderately deflexed horns which are in close contact with one another, except sometimes at the extreme tip.

The eyes are enclosed in tubular orbits formed by a prominent supra-ocular roof the anterior angle of which is strongly produced forwards, by a cupped post-ocular tooth, and by a process of the broad basal antennal joint, all three elements being in the closest contact. The mobile portion of the antenna is completely exposed.

The external maxillipeds have the merus broader than the ischium owing to the expansion of its external angle, and the palp inserted in a slight notch in the internal angle of the merus.

The chelipeds are little enlarged in the male: the ambulatory legs have the dactylus short and claw-like.

The abdomen in both sexes consists of seven distinct segments.

Tiarinia cornigera, (Latr., Edw.)

[*Pisa cornigera*, Latr., Encyc., X. 141.]

Pericera cornigera, Milne-Edwards, Hist. Nat. Crust., I. 335; and Adams and White, 'Samarang' Crust., p. 18.

Tiarinia cornigera, Dana, U. S. Expl. Exped., Crust., pt. I. p. 110, pl. iii. figs. 5*a–e*; and Stimpson, Proc. Acad. Nat. Sci., Philad., 1857, p. 217; and Haswell, Proc. Linn. Soc., N. S. Wales, Vol. IV. 1879, p. 449, and Cat. Austral. Crust., p. 28; and Miers, Ann. Mag. Nat. Hist., 1880, Vol. V. p. 228; and Mary J. Rathbun, Proc. U. S. Nat. Mus., Vol. XV. 1892, pp. 243 and 276.

? *Pericera tiarata* and *setigera*, Adams and White, 'Samarang' Crust., p. 17.

Tiarinia verrucosa, Heller, 'Novara' Crust., p. 4, taf. i. fig. 3.

Tiarinia mammillata, Haswell, Proc. Linn. Soc., N. S. Wales, Vol. IV. 1879, p. 448, and Cat. Austral. Crust., p. 27.

Body and ambulatory legs with many curly hairs.

Carapace pyriform, the regions well-defined, the surface closely and very variedly pustular nodular and granular, but with the following markings fairly constant:—two parallel longitudinal lines of small nodules between the orbits; a "cross" of larger nodules on the gastric region, the base of the cross being formed by three pustules; three pustules arranged in a triangle base forwards on the cardiac region, behind which are three conical tubercles arranged in a transverse line; a coarse claw-like tooth at the lateral epibrancial angle.

The rostrum consists of two moderately deflexed spines, which are parallel, and in the closest contact, either throughout their extent, or to near the tips, which may then be upcurved and slightly divergent: the length of the rostrum varies from nearly one-half to one-fourth the length of the carapace, its usual length is about $\frac{2}{7}$ths that of the carapace.

The antennæ have the basal joint broadened and produced to form the floor of the orbit, the antero-external angle being further produced to form a coarse spine: the next two joints are broadened and fringed with stiff bristles: the flagellum is short. The eyes are ensheathed in orbits which are formed as already described: the supra-ocular eave has a dog's-ear form, and the post-ocular tooth is also salient. The chelipeds in the adult male are as long as the carapace without the rostral spines, and are a little stouter than the other legs: the merus is nodular, most markedly so on the upper surface; the carpus is granular; and the palm—which is a good deal broadened and inflated—and the fingers, are smooth and polished, the fingers being arched and meeting only at tip.

In the female and young male the chelipeds are only as long as the post-orbital portion of the carapace, are slenderer than the other legs, and have the palm slender, the fingers however being arched.

The ambulatory legs are stout, and have strong claw-like dactyli, the posterior border of which is denticulate; the ischium in all is swollen, and is more or less nodular on the upper surface; and the carpus in all is broadened: the first pair, which are considerably the longest, slightly exceed the length of the carapace and rostrum.

In the Museum collection are forty well preserved specimens from the Andamans.

The closeness of the relation between *Tiarinia* and *Micippa* is well seen in the very young of the above species, in which the carapace is depressed and is so broad in front as to be almost oblong, and the rostrum is deflexed at an angle of 45°.

Family II. PARTHENOPIDÆ.

Parthenopiens (*part.*) and *Canceriens cryptopodes*, Milne-Edwards, Hist. Nat., Crust., I. pp. 347 and 368.

Parthenopinea, Dana, U. S. Expl. Exp., Crust., I. pp. 77 and 136.

Parthenopinea, Miers, Journ. Linn. Soc., Zool., Vol. XIV. p. 641; and 'Challenger' Brachyura, p. 91.

The eyes are usually retractile within small circular well-defined orbits, the floor of which is nearly continued to the front, leaving a hiatus which is usually filled by the second joint of the antennary peduncle. The basal antennal joint is small, and is deeply imbedded between the inner angle of the orbit and the antennulary fossæ.

The antennules fold a little obliquely.

The *Parthenopidæ* are divided by Miers into two sub-families, namely:—

Sub-family I. *Parthenopinæ*; in which the carapace is sometimes sub-pentagonal or ovate-pentagonal, more commonly equilaterally-triangular, and sometimes almost semi-circular or semi-elliptical in outline; in which the cardiac and gastric regions are usually so deeply marked off from the branchial regions on either side as to make the dorsal surface of the carapace trilobed; in which the chelipeds are vastly longer and more massive than the ambulatory legs; and in which the rostrum is either simple or obscurely trilobed.

Sub-family II. *Eumedoninæ*; in which the carapace is, commonly, sharply pentagonal, with the junction of the antero-lateral and postero-lateral borders strongly produced; in which the cardiac and gastric regions are not conspicuously marked off from the branchial regions; and in which the chelipeds are of moderate size.

Sub-family I. PARTHENOPINÆ, Miers.

Miers, Journ. Linn. Soc., Zool., Vol. XIV. 1879, p. 668.

Key to the Indian genera.

I. Carapace not laterally expanded:—
   1. Basal antennal joint very short, not nearly reaching the inner canthus of the orbit: fingers of chelipeds very strongly incurved... LAMBRUS.
   2. Basal antennal joint nearly reaching the inner canthus of the orbit: fingers slightly incurved .... PARTHENOPE.

II. Carapace more or less expanded to form a vault in which the ambulatory legs are concealed:—
   1. Carapace transversely triangular; greatly expanded both laterally and posteriorly ...... CRYPTOPODIA.
   2. Carapace transversely triangular; expanded laterally, but not posteriorly: a ridge on the pterygostomian region............................ HETEROCRYPTA.

3. Carapace transversely oval; expanded laterally, but not posteriorly: no ridge on the pterygostomian region.............. . ... ŒTHRA.

LAMBRUS, Leach.

Lambrus, Leach, Trans. Linn. Soc., Vol. XI. 1815, pp. 308, 310.
Lambrus, Milne-Edwards, Hist. Nat. Crust., I. 352.
Lambrus, A. Milne-Edwards, Miss. Sci. Mex., Crust., I. p. 146.
Lambrus, Miers, J. L. S., Zool., Vol. XIV. 1879, p. 668; and 'Challenger' Brachyura, p. 91.

Carapace either broadly triangular with rounded sides and pointed front, or ovate-pentagonal with front pointed but extremely short: the surface is granular, or tubercular, or spiny.

The eyes are enclosed in distinct orbits, which have a suture above and a hiatus below, the hiatus being occupied by the second joint (true third joint) of the antennal peduncle.

The antennules fold obliquely. The antennæ are small: their basal joint, which is extremely short, and does not reach the front, is wedged in between the antennulary fossa and the large lobe that constitutes the floor of the orbit.

The buccal frame is usually quadrangular, but is sometimes a little narrowed in front; it is completely closed by the external maxillipeds: the epistome is sometimes very large, sometimes narrow.

The chelipeds are usually of immense size and length, out of all proportion to the short slender ambulatory legs: the meropodite and "hand" are usually prismatic, with the borders strongly dentate: the fingers are much shorter than the palm, and are abruptly curved inwards and a little downwards.

The abdomen of the female usually consists of seven segments; that of the male of five or six.

Professor A. Milne-Edwards, (Miss. Sci. Mex., Crust., I. pp. 146–148) subdivides the genus Lambrus into ten sub-genera, the independence of all of which, however, is not universally admitted.

The sub-genera at present known to exist in Indian waters are shown in the following

Key to the Indian sub-genera of the genus Lambrus.

I. Carapace tuberculate, ovate-pentagonal, the rostrum not breaking beyond the general outline of the body: the buccal frame a little narrowed in front........................ LAMBRUS.

II. Carapace strongly carinated or tuberculated, broadly triangular (considerably broader than long), with rounded sides and a broad but sharp-pointed projecting rostrum: no post-ocular constriction: chelipeds with the arm and hand straight, sharply trigonal, the edges of these joints, as also the outer edge of the carpus, being very sharply and stoutly serrated.............................. PLATYLAMBRUS.

III. Carapace granular or spiny, usually as long as broad, with a projecting rostrum, and a very distinct post-ocular constriction.. RHINOLAMBRUS.

IV. Carapace granular, broader than long, and with the postero-lateral angle produced to form a great blade-like spine. Pterygostomian region deeply channelled, obliquely, the channel being closed below by thick fringes of hairs..... AULACOLAMBRUS.

V. Carapace worn and eroded, broader than long, almost semicircular in outline, with the postero-lateral angle produced; the rostrum more or less deflexed, and not, or hardly, breaking the general outline: no post-ocular, but a fairly distinct post-hepatic constriction: chelipeds with the arm and hand indefinitely contorted, not sharply trigonal; and with their edges, if spinate, irregularly and bluntly so; the carpus quite smooth externally: the chelipeds are short for the genus................. PARTHENOLAMBRUS.

Sub-genus LAMBRUS, A. Milne-Edwards.

Lambrus, A Milne-Edwards, Miss. Sci. Mex. Crust., I. p. 146.

Lambrus, Miers, 'Challenger' Brachyura, p. 92, (*part.*)

Carapace ovate-pentagonal, with the surface granular or pustular and but little carinate in the adult: rostrum exceedingly short.

Lambrus longimanus, Leach.

? *Cancer spinosus longimanus*, Rumph, Amboin. Rariteitk., pl. viii. fig. 2.

Cancer macrochelos, Seba, III. xix. 1, 8, 9.

? *Parthenope longimanus*, Fabr. Suppl., p. 353.

? *Cancer longimanus*, Linn., Syst. Nat., II. 1046, 42.

? *Cancer longimanus*, Herbst, Krabben, I. ii. 253, taf. xix. figs. 105, 107.

Lambrus longimanus, Leach, Trans. Linn. Soc., Vol. XI. 1815, p. 310; and Milne-Edwards, Hist. Nat. Crust., I. 354; and Cuvier, Regne Animal, pl. xxvi. fig. 1; (and ? *Lambrus longimanus*, Adams and White, 'Samarang' Crust., p. 30); and Bleeker, Crust de l'Ind. Archip., p. 17 (*nec syn.* pelagicus, *Rupp.*); and Miers, Ann. Mag. Nat. Hist., 1879, Vol. IV. p. 20, and Zoology H. M. S. 'Alert,' pp. 182 and 200, and 'Challenger' Brachyura, p. 95; and W. A. Haswell, P. L. S., N. S. Wales, Vol. IV. 1879, p. 449, and Cat. Austral. Crust., p. 31; and A. O. Walker, J. L. S., Zool., Vol. XX. 1890, p. 109; and de Man. J. L. S., Zool., Vol. XXII. 1888, p. 21 (*ubi synon.*); and Henderson, Tr. Linn. Soc., Zool., (2) V. 1893, p. 349.

Carapace almost oval transversely, and with the surface granular or pustular. (In the young, besides tubercles, there are some coarse spinules in five series—a median, and two oblique lateral on either side.) The lateral borders are spinulate or crenulate anteriorly, spinate posteriorly, smooth quite posteriorly at the junction with the posterior border: the posterior border, except for a hook-like spinule at either end, and two spinules in the middle line, is smooth: there are often one or two curved spines on the branchial region: the pterygostomian region is quite smooth, but on the inferior branchial region are a few coarse spinules, most distinct at the bases of the legs.

The rostrum, which is symmetrically trilobed, is very small, its length being less than one-twelfth that of the rest of the carapace.

The chelipeds, which are massive, are about four times the length of the carapace in the male, about 3½ times in the female: the *meropodite* is prismatic, or, in transverse section, rhomboidal; its anterior and posterior edges are armed with numerous, somewhat curved, spines —alternating larger and smaller; its upper edge, as sometimes either upper surface, has a row of spinules; its lower edge is rounded, and has a discontinuous series of spinules; its under surfaces are smooth and polished: the *carpus* has 3 or 4 sharp thin teeth on its outer margin: the trigonal *palm* has twelve or more sharp thin laciniated teeth on its outer edge—alternately larger and smaller; along its inner edge is a long series of multicuspid spines; its under edge is finely beaded, and its under surfaces are almost smooth; its upper surface has numerous irregularly disposed spinules and granules: the *dactylus* has numerous spinules on the outer surface of its broad base.

The ambulatory legs have the merus compressed and spinulate as to its edges, especially the posterior (inferior) edge: the longest of the ambulatory legs is hardly longer than the meropodite of the chelipeds.

Colours in life, pale lilac dorsally, white ventrally.

In the Museum collection are numerous specimens from the Madras coast, from Arrakan and Mergui, and from the Andamans.

Sub-genus PLATYLAMBRUS, Stimpson.

Platylambrus and *Enoplolambrus*, A. Milne-Edwards, Miss. Sci. Mex., Crust., I. pp. 146 and 147.

Lambrus, Miers, 'Challenger' Brachyura, p. 92 *(part)*.

Carapace carinated or tuberculated, broader than long, broadly triangular with rounded sides and a broad but acute and projecting rostrum: no post-ocular constriction: chelipeds with the meropodite dan palm straight, the former joint prismatic, the latter sharply trigonal, the anterior and posterior borders of both joints sharply laciniate or serrate, as is also the outer edge of the carpus.

Key to the Indian species of the sub-genus Platylambrus.

I. Carapace with three distinct carinæ, one median, and one, oblique, on either side: chelipeds with their surfaces (but not their edges) for the most part smooth: ambulatory legs, with few spines.	1. Infra-orbital lobe entire and strongly produced at the inner (inferior) angle to form a great spine plainly visible from above on either side of the rostrum	*L. prensor.*
	2. Infra-orbital lobe deeply cleft, the inner portion not or hardly visible from above	*L. carinatus*, Edw.
II. Carapace covered with great mushroom-like or paxilliform tubercles: chelipeds with their surfaces very strongly spinate or tuberculate: ambulatory legs strongly spiniferous		*L. echinatus.*

Lambrus (Platylambrus) *prensor*, Herbst.

Lambrus prensor, Herbst, Krabben, II. ii. 170, tab. xli. fig. 3.

Lambrus prensor, Milne-Edwards, Hist. Nat. Crust., I. 358.

Lambrus jourdainii, F. de B. Capello, Jorn. Sci. Lisb., III. 1870-71, tab. 3, fig. 6.

Lambrus prensor, A. Milne-Edwards, Nouv. Archiv. du Mus., Vol. VIII. 1872, p. 260 (foot-note); and Miss. Sci. Mex., Crust., I. p. 147 (foot-note).

Lambrus prensor, Walker, J. L. S. Zool., Vol. XX. 1890, p. 109 (name only).

Our numerous specimens correspond exactly with Capello's figure and succint and graphic description. M. A. Milne-Edwards at first assigned Capello's species to *L. carinatus*, Edw., but afterwards to *L. prensor*, and it is this last authority that I now follow.

Carapace broader than long, broadly triangular with the sides rounded: the median and branchial regions are strongly prominent, the former having three small spinules in the middle line, the latter having each two oblique granular ridges, one of which is very faint and runs to the large lateral epibranchial spine, the other of which forms a strong carina, and runs to the large spine at the postero-lateral angle. The antero-lateral margin is armed with 7 or 8 nearly equal-sized close-set compressed teeth, behind which, at the lateral epibranchial angle, is a very large blade-like spine: behind this again, on the postero-lateral border are two large teeth, the outer of which, at the postero-lateral angle, is nearly as large as the lateral epibranchial spine; and lastly on the posterior border are three large curved spines.

The rostrum is acute, concave at base, and slightly recurved at tip: on either side of the rostrum is seen from above a very strong and acute spine formed by the prolongation of the inner margin of the infra-orbital lobe—this lobe is entire.

The chelipeds are massive and are about three times the greatest length of the carapace: their surfaces are almost smooth: the arm is rhomboidal in transverse section, and the palm is sharply trigonal: the lower edges of the arm, wrist and palm form a continuous line of beading: the upper edge of the arm is granular and spinular: the inner or anterior edges of the arm, wrist and hand are spinate—the spines growing larger towards the end of the palm, while the posterior (or outer) edges of the same three joints are very strongly and closely laciniate.

As usual the spines in all cases have a tendency to be alternately larger and smaller.

Of the ambulatory legs the merus, carpus and propodus have the anterior (upper) border strongly and sharply carinate, while the merus has also the posterior border spinate.

This species is not uncommon along the Orissa coast, from 8 to 23 fathoms.

Lambrus (*Platylambrus*) *carinatus*, Edw.

Lambrus carinatus, Milne-Edwards, Hist. Nat. Crust., I. 358.

Lambrus carinatus, A. Milne-Edwards, Miss. Sci. Mex., Crust., I. p. 147 (foot-note).

Our specimens, which agree with the diagnoses of M. A. Milne-Edwards completely, are distinguished from those above described as *L. prensor*, (1) by having the mid-dorsal carina formed by three great compressed teeth; (2) by the single, and very high and sharply cut carina on either branchial region; (3) by the smaller size of the spine at the lateral epibranchial angle and of the spine, at the postero-lateral angle, immediately succeeding it; (4) by the form of the infra-orbital lobe, which instead of being entire, is bilobed—the inner lobe, moreover, having a rounded apex, and not being visible from above; (5) by the meropodites of the ambulatory legs having their anterior (upper) edge serrate, not carinate, and by the carpopodites and propodites having the anterior edge smooth.

These differences are constant in a series of twelve specimens, including both sexes.

This species also differs from *L. prensor* in its much smaller size, three ovigerous females having the carapace 11 millim. in its greatest breadth (exclusive of spines), while ovigerous females of *L. prensor* have the carapace 28 to 30 millim. in its greatest breadth exclusive of spines.

[? *Lambrus (Platylambrus) holdsworthii*, Miers.

Lambrus holdsworthii, Miers, Ann. Mag. Nat. Hist., Vol. IV. 1879, p. 19, pl. v. fig. 3; and 'Challenger' Brachyura, p. 93; and Henderson, Trans. Linn. Soc., (2) V. 1893, p. 350.

The single specimen that I doubtfully refer, from Miers' figure and description, to this species, has a close resemblance to both the species identified above as *L. prensor* and *L. carinatus*. It differs from them both (1) in having numerous scattered tubercles on the carapace, and (2) in having the large spine at the lateral epibranchial angle and the *two* outer spines on the postero-lateral margin all of about the same size. It resembles *L. prensor*, and differs from *L. carinatus*, in not having the branchial region traversed by a single sharp-cut carina: and it resembles *L. carinatus*, and differs from *L. prensor*, in having a median line (though not a high carina) of three large teeth, in having the infra-orbital lobe deeply cleft and not exceedingly produced, and in having the anterior (or upper) edge of the meropodites of the ambulatory legs dentate instead of carinate.]

Lambrus (Platylambrus) echinatus, Herbst.

Cancer echinatus, Herbst, Krabben, I. ii. 255, taf. xix. figs. 108-109.
Parthenope giraffa, Fabr., Supplement, p. 353.
[*Maia echinatus* and *giraffa*, Bosc, I. 250].
Lambrus giraffa, Desmarest, Consid. Crust., p. 85.
Lambrus echinatus, Milne-Edwards, Hist. Nat. Crust., I. 356.
Lambrus echinatus, Miers, 'Challenger' Brachyura, p. 93.

Carapace broader than long, broadly triangular with the sides rounded: the gastric and cardiac regions are elevated, and are delimited on either side from the elevated branchial regions by broad and deep grooves. The entire carapace is covered, but not very densely, with large mushroom-like and paxilliform tubercles, the spaces between which are occupied, but not densely, by short, crisp, upstanding hairs. The lateral margins are armed with ramose spines, which increase in size from before backwards: the posterior and part of the postero-lateral margins are armed with tubercles like those on the surface of the carapace. The granular rostrum is broad and concave at the base, and is then suddenly narrowed to form a little peak.

The chelipeds which are from $3\frac{1}{2}$ (female) to $3\frac{3}{4}$ (male) the greatest length of the carapace, are distinguished by having their upper aspect (edges and surfaces) covered with ramose spines, and their under aspect covered with great pearly tubercles. The ambulatory legs are distinguished by the large and numerous spines on their 3rd, 4th and 5th joints.

This species is not uncommon off the Orissa coast from 7 to 23 fathoms.

Sub-genus RHINOLAMBRUS, A. Milne-Edwards.

Rhinolambrus, A. Milne-Edwards, Miss. Sci. Mex., Crust., I. p. 148.
Lambrus, Miers, 'Challenger' Brachyura, p. 92 (*part.*).

Carapace triangular, usually as long as broad, with a broad projecting somewhat declivous rostrum and a very distinct post-ocular constriction; surface of carapace very commonly, but not always, spiny and granular.

Key to the Indian species of the sub-genus Rhinolambrus.

- I. Chelipeds stout, three times to twice or less the length of the carapace and rostrum.
  - 1. Carapace and chelipeds very closely covered with large rugged granules and sharp ramose spines.
    - i. Chelipeds nearly three times the length of the carapace and rostrum...... .. .. *L. contrarius.*
    - ii. Chelipeds not two-and-a-half times the length of the carapace and rostrum........ *L. longispinis.*
  - 2. Carapace with few depressed tubercles, or nearly smooth: chelipeds with blunt teeth or smooth granules.
    - i. Chelipeds three times the length of the carapace and rostrum........ *L. pelagicus.*
    - ii. Chelipeds not twice the length of the carapace and rostrum .... *L. gracilis.*
- II. Chelipeds slender, three-and-a-half to five times the length of the carapace and rostrum.
  - 1. Carapace at least as long as broad: large erect turret-like spines on the carapace.
    - i. A single turret on the cardiac region, and on either branchial region: two large diverging spines in the middle line on the posterior border... *L. turriger.*
    - ii. Two turrets on the cardiac region, and two on either branchial region: a single spinule on the posterior margin............... *L. cybelis.*
  - 2. Carapace broader than long; large spines of ordinary form on the carapace *L. petalophorus.*

Lambrus (Rhinolambrus) contrarius, Herbst.

Cancer contrarius, Herbst, Krabben, III. iv. 18, tab. lx. fig. 3.

[*Parthenope spinimana*, Lamk., Hist. Anim. Sans. Vert., V. 239.]

Lambrus spinimanus, Desmarest, Consid. Crust., p. 86, pl. iii. fig. 1.

Lambrus contrarius, Milne-Edwards, Hist. Nat. Crust., I. 354.

Lambrus contrarius, Bleeker, Recherches Crust. de l' Ind. Archip., p. 18.

Lambrus contrarius, A. Milne-Edwards, Maillard's l' ile Réunion, Annexe F, p. 10.

Lambrus contrarius, Brocchi, Ann. Sci. Nat., (6) II. 1875, Art. 2, p. 98, pl. xviii. figs. 166, 167 (♂ appendages).

Lambrus contrarius, Richters, in Möbius, Meeresf. Maurit., p. 145.

Lambrus contrarius, Miers, Ann. Mag. Nat. Hist., 1880, Vol. V. p. 230; and 'Challenger' Brachyura, p. 94.

Lambrus contrarius, J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 350.

Carapace, with rostrum, slightly longer than broad, everywhere covered with jagged granules and spines: the regions are strongly convex, and, usually, in the middle line, are three or four, and again on either branchial region, one or two spines of predominant size. The rostrum is broad, prominent, declivous, and spiny or granular, both on the upper surface and along the margins. The hepatic regions are very prominent, and their angle is strongly produced. The orbital edge is prominent and the post-orbital constriction strongly pronounced.

The chelipeds are about three times the length of the carapace and rostrum, and are extremely massive, the hands especially: above they are covered with large sharp jagged spines with rough tubercles interpersed; below they are everywhere covered with rasp-like granules, The ambulatory legs are rather stout for a *Lambrus*, and have the merus somewhat spiny along one or both edges.

Colours in spirit, mottled pink, tips of fingers purple-black, ambulatory legs banded alternately yellow and bluish pink.

Our largest specimens, a male and a female, are from off Colombo, 26½ fathoms, and have a span (of chelipeds) of 290 millim. and 265 millim. respectively.

Lambrus (Rhinolambrus) longispinis, Miers.

Lambrus longispinus, Miers, Ann. Mag. Nat. Hist., 1879, Vol. IV. p. 18; Zoology H. M. S. 'Alert,' pp. 182 and 199; and 'Challenger' Brachyura, p. 93.

Lambrus longispinus, de Man, Archiv. fur Naturgesch., LIII. 1887, p. 229.

Lambrus longispinus, Walker, Journ. Linn. Soc., Zool., Vol. XX. 1890, p. 109.

Lambrus longispinus, Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 350.

Lambrus spinifer, Haswell, P. L. S., N. S. Wales, Vol. IV. 1879, p. 451, pl. xxvii. fig. 1; and Cat. Aust. Crust., p. 34.

Carapace, with rostrum, little longer than broad, its surface covered with spiny tubercles: There are four prominent spines in the middle line, of which three are on the cardiac and one is on the gastric region; in front of the latter are two smaller spines placed transversely: on the branchial regions are some small spines set in two oblique series, and one large spine. On the antero-lateral margins are about nine small close-set blunt faintly-laciniated teeth, slightly increasing in size posteriorly; on the postero-lateral margin are two large spines; and on the posterior border, in the middle line, is a pair of spines. The rostrum is broad, prominent, acute and declivous. The post-ocular constriction is distinct; and the hepatic regions are well marked, with the outer border denticulate. The chelipeds in the male are about $2\frac{1}{2}$ times the length of the carapace and rostrum: they much resemble those of *L. contrarius*, the spines being for the most part jagged, and the tubercles rasp-like. On the anterior (inner) margin of the arm are 10 or 12 spines alternating in size, the last three being very small; on the upper surface of the arm three spines are very prominent, as are three or four on the posterior (outer) edge. On the anterior (inner) margin of the hand are 7 or 8 spines increasing in size from behind forwards; while on the posterior margin are numerous spines—only three or four of which are large. The lower surface of the arms, wrists and hands is closely covered with large round rasp-like tubercles. The merus and sometimes the two following joints of the ambulatory legs, have the margins dentate.

Our single specimen from the Arrakan coast, 13 fms., is plainly the same as Haswell's *L. spinifer*, judging from his figure (*tom. cit.*) Both from that figure and from our specimen I should consider the species to be more nearly related to *L. contrarius* than to *L. validus*.

Lambrus (*Rhinolambrus*) *pelagicus*, Rüpp.

Lambrus pelagicus, Rüppell, Beschr. u. Abbild. 24 Art. Krabben des Roth. Meer., p. 15, pl. iv. fig. 1.

Lambrus pelagicus, Milne-Edwards, Hist. Nat. Crust., I. 355.

Lambrus pelagicus, Rüpp. (prob. = *affinis*, A. M.-Edw.) Miers, Ann. Mag. Nat. Hist., 1879, Vol. IV. p. 21.

Lambrus pelagicus, Ortmann, Zool. Forsch. in Austral. u. Malay. Archip., Jena, 1894, p. 46.

Lambrus affinis, A. M.-Edw., Nouv. Archiv. du Mus., VIII. 1872, p. 261, pl. xiv. fig. 4.

Lambrus affinis, Haswell, Cat. Austral. Crust., p. 34.

Lambrus affinis, Miers, 'Challenger' Brachyura, p. 95.

Lambrus affinis, J. R. Henderson, Trans. Linn. Soc., Zool. (2) V. 1893, p. 350.

[*Lambrus affinis*, F. Muller, Verh. Ges. Basel, VIII. p. 473.]

[*Lambrus affinis*, Cano, Boll. Soc. Nat. Napol., III. 1889, p. 187.]

Carapace, with rostrum, as long as broad: its regions well delimited and faintly pitted and pimpled, the furrows between the regions being smooth and bare—except for a pimple at each of the four angles of the cardiac region. On either branchial region, above the postero-lateral angle of the carapace, is a bluntly conical spine. The rostrum is very broad, and is concave and bluntly pointed: on either side above the eye is a little eminence which carries a tuft of long silky hairs. The post-ocular constriction is distinct, as is also the post-hepatic. The antero-lateral (including the hepatic) margin is faintly crenulated: the posterior border is quite smooth.

The chelipeds in the male are three times the length of the carapace, but not more than $2\frac{1}{2}$ times in the female: the anterior (or inner) margin of the arm and hand is evenly and bluntly dentate, or crenulate; the posterior (or outer) margin in the same joints is as evenly but much more bluntly and indistinctly dentate, and the lower margin faintly beaded: the carpus is either quite smooth or has a few nodules.

The ambulatory legs are smooth, rather stout, and are longer than the hand. In the male near the anterior border of the 6th abdominal tergum is a strong spine. This is a fairly common species at the Andamans.

Lambrus (Rhinolambrus) gracilis, Dana.

Lambrus gracilis, Dana U. S. Expl. Exp. Crust., pt. I. p. 137, pl vi. figs. 6 *a–b*.

Lambrus gracilis, Miers, 'Challenger' Brachyura, p. 94.

Lambrus deflexifrons, Alcock and Anderson (*nec* Miers), J. A. S. B., 1894, pt. ii. p. 199.

Carapace, with rostrum, considerably longer than broad; with a pronounced post-ocular constriction; somewhat rhomboidal in shape: the regions are extremely prominent, especially the cardiac, which is capped by a conical tooth, and the branchial, which rises into an oblique crest terminating posteriorly in a tooth: the hepatic region forms a prominent tooth, behind which the rounded lateral margins are 6 or 7 toothed: there are two laminar teeth on the posterior border: otherwise the carapace is smooth. The rostrum is broad, deflexed, and distinctly trilobed towards the tip.

The chelipeds are not quite twice the length of the carapace and rostrum; and in the adult are not symmetrical—one, either right or left, having the hand much larger than the other. In the young the asymmetry is hardly noticeable. The *arm* has the anterior (inner) and posterior (outer) border irregularly armed with compressed blunt spines, of which the one at the far end of the outer border is the largest—being almost foliaceous: the *hand* has its inner and outer borders armed in the same irregular way, two or three of the teeth on the outer border, and one on the inner border being enlarged: the under surfaces of the chelipeds are quite smooth, but the upper surface of the arm has an incomplete longitudinal line of beading. The ambulatory legs are long and particularly slender.

In the Museum collection are specimens of males, ovigerous females and young, from the Andamans and from off Ceylon.

Lambrus (Rhinolambrus) deflexifrons, Miers.

Lambrus deflexifrons, Miers, Ann. Mag. Nat. Hist., Vol. IV. 1879, p. 21, pl. v. fig. 5. Ceylon.

This species, which is not represented in the Museum collection, is described as follows by Miers :—

"The carapace is strongly constricted behind the orbits, with the cardiac region very convex, and with an oblique but shallow sulcus on the branchial regions, and is covered with closely-set small tubercles; the antero-lateral margins are unarmed; but there are two larger tubercles or small spines on the postero-lateral margins. The rostrum is vertically deflexed, triangular, and granulated above. The basal antennal joint is very small; the epistoma is large; the sub-hepatic and pterygostomian regions are not channelled. The anterior legs have the arm rounded and tuberculate above, with small spines on its anterior margin; the wrist is tuberculate; the hand with a few tubercules on its upper surface, the anterior margin armed with about ten, and the posterior with four granulated spines. The under surface of arm, wrist, and hand is closely granulated. The ambulatory legs are smooth, and are not compressed and cristate as usual in the genus.

The vertically deflexed rostrum and carapace, devoid of spines on its surface and anterior margins, and non-compressed ambulatory legs are characteristic of this species. It seems to be allied to *L. gracilis*, Dana, a species from the Fijis, in the form of the carapace and legs; but in that species the carapace has a spine on the cardiac and each branchial region, and elsewhere appears to be smooth."

Lambrus (Rhinolambrus) turriger, Ad. & Wh.

Lambrus turriger, White, P. Z. S., 1847, p. 58; Ann. Mag. Nat. Hist., Vol. XX. 1847, p. 63; and Adams and White, 'Samarang' Crust., p. 26, pl. v., fig. 2.

Lambrus turriger, W. A. Haswell, Proc. Linn. Soc., N. S. Wales, Vol. IV. 1879, p. 449; and Cat. Austral. Crust., p. 32.

LAMBRUS TURRIGER, MIERS, ZOOLOGY H. M. S. 'ALERT,' p. 201; and 'Challenger' Brachyura, p. 96.

Carapace, with rostrum, a little broader than long; slightly granular; the regions well-defined and armed with huge, erect or semi-erect, knob-headed spines, as follows :—one on the gastric region, in the middle line, one on the cardiac region in the middle line, and one on each branchial region: there is sometimes a little spinule in front of the gastric spine, and one in front of either branchial spine; and on the posterior border, in the middle line, are two divergent spines directed backwards. The rostrum is broad, concave between the eyes, somewhat deflexed, and may be described as trilobed near the tip—since it is there suddenly truncated and continued in the middle line only.

There is a distinct post-ocular constriction, and the hepatic regions are well-defined laterally.

The chelipeds are long slender and rugose: the arm is cylindrical, and the palm subcylindrical, becoming enlarged and trigonal near the fingers: in the male the chelipeds are from 4½ to 5½ times the length of the carapace and rostrum, in the female they are but 3⅓ to 3½ times this length.

The ambulatory legs are long, very slender, and perfectly smooth.

In the Museum collection are numerous specimens from the Andamans, from the Madras coast, and from off Ceylon at 32 to 34 fathoms.

There are undoubtedly two sorts of males: one sort resembling the female in having the chelipeds comparatively short, the other sort having very long chelipeds.

Lambrus (*Rhinolambrus*) *cybelis*, n. sp.

This species closely resembles *L. turriger*, from which it differs only in the following characters:—

(1) the regions of the carapace are all more elevated, and on the cardiac region—one behind the other, in the middle line—as well as on either branchial region, are *two* very large semi-erect spines of equal size; while in the middle of the granular posterior border is a single spinule:

(2) the surface of the carapace, besides being granular, is very evenly and regularly pitted or reticulated:

(3) the rostrum, which is nearly one-third the greatest breadth of the carapace, is more distinctly trilobed:

(4) the chelipeds (which in females and young males are only 3¼ to 3½ times the length of the carapace and rostrum), though of the same general slender proportions as in *L. turriger*, have the hand distinctly trigonal throughout, and the arm and hand armed with sharp laciniated spines on the upper aspect.

A young male from off Ceylon, 34 fms., and two probably half-grown males, and an ovigerous female, from off the Andamans, 41 to 86 fathoms.

The characters that distinguish this species are constant throughout the series, without any modification or variation.

Greatest length of carapace in ovigerous female	...	15 millim.
Do. breadth do. do. do.	...	15 millim.
Length of chelipeds in ovigerous female	...	52 millim.

Lambrus (*Rhinolambrus*) *petalophorus*, n. sp.

Carapace of the same general shape as in *L. turriger*, but broader posteriorly, where its breadth exceeds its length with the rostrum. The hepatic region is extremely well demarcated, not by its prominence, but by its almost vertical outer wall.

The cristiform antero-lateral border, which runs from the angle of the buccal frame outside the limit of the hepatic region, is festooned by 7 or 8 close-set thin teeth, and there is a strong upcurved spine at the postero-lateral angle.

The postero-lateral border carries three teeth, the innermost of which is hardly less prominent than that at the postero-lateral angle: the posterior border is finely denticulated.

The rostrum, the breadth of which is about $\frac{2}{7}$ the greatest breadth of the carapace, is elegantly trilobed.

The regions of the carapace are strongly elevated, and have the surface pitted or reticulated: in the middle line on the gastric region is a single erect conical spine, on the cardiac region two; and on either branchial region there is a spine. In front of the gastric spine are two spinelets, disposed transversely.

The supra-orbital margin is strongly arched, and the infra-orbital lobe is cut into two elegantly crimped leaflets or petals.

The post-ocular constriction is distinct.

The chelipeds in the male are four and-a-half times the length of the carapace and rostrum: the *arm* is slender and subcylindrical, with a line of many spinules along both the inner and outer borders, a broken line of sharp tubercles along its upper surface, and a line of granules along its lower border, but is otherwise smooth and polished: the *carpus* has a few coarse spinules on its outer surface: the *hand*, though distinctly trigonal, is long and slender, but is enlarged at the far end; its inner and outer borders are irregularly and unequally laciniated, the teeth becoming larger and closer set towards the far end; except for a line of beading along its lower border and an occasional spinule on its upper surface, its surfaces are smooth and polished: the movable *finger* has its broad base denticulated.

The ambulatory legs are very slender and very short—only one-fifth longer than the carapace: except for a line of spinules along the posterior (lower) border of the meropodite they are smooth.

Greatest length of carapace (male)	16 millim.
„ breadth „	18 „
Length of cheliped	72 „

Off Ceylon in deep-water.

Colours in spirit: chelipeds and legs purplish white, carapace dull slaty purple.

Sub-genus Aulacolambrus, A. M.-Edw.

Aulacolambrus, A. Milne-Edwards, Miss. Sci. Mex. Crust., I. p. 147.
Aulacolambrus, Miers, 'Challenger' Brachyura, p. 97.

Pterygostomian region traversed, from the orbit to the afferent branchial orifice, by a deep channel, which is closed and converted into a tube by thick fringes of hairs: the lateral epibranchial spine is of huge size: the edges of the carapace chelipeds and legs are more or less conspicuously hairy.

Key to the Indian species of the sub-genus Aulacolambrus.

I. Carapace as long as broad, with a projecting rostrum and a distinct post-ocular constriction; its surface closely covered with rasp-like tubercles: carapace and legs not conspicuously hairy..			*L. sculptus.*
II. Carapace broader than long, its surface irregularly tuberculate; rostrum not or hardly projecting: no post-ocular constriction: margins of carapace, chelipeds and legs fringed with remarkably long tangled hairs.	1. Antero-lateral border with large spines in front of the large lateral epibranchial spines: spines of inner edge of hand strongly curved upwards and outwards..		*L. curvispinis.*
	2. Antero-lateral border with small teeth in front of the large lateral epibranchial spines: spines of inner edge of hand not curved.	a. No spines in middle line of carapace, or on branchial regions.......	*L. hoplonotus.*
		b. Some spines in middle line of carapace, and on branchial regions: spines on outer edge of hand very long.................	*L. whitei.*

Lambrus (*Aulacolambrus*) *sculptus*, A. M.-Edw.

Lambrus sculptus, A. Milne-Edwards, Nouv. Archiv. du Mus., VIII. 1872, p. 258, pl. xiv. fig. 3.
Lambrus sculptus, Miers, 'Challenger' Brachyura, p. 98.
Lambrus sculptus, J. R. Henderson, Trans. Linn. Soc., Zool. (2) V. 1893, p. 350.

The carapace is triangular, broad behind, and as long as broad. The rostrum is triangular, dorsally grooved and declivous, and tapers to a rounded point. The regions are elevated, and the median are separated from the branchial by deep furrows: all the regions are closely covered by rasp-like tubercles.

The lateral borders are tubercular, and end posteriorly in a large spine directed outwards and somewhat backwards.

Internal to this large spine is a much smaller spine; and the posterior border is tuberculate.

The chelipeds are a little more than twice the length of the carapace, with the inner and outer borders serrated, and the upper surface covered with tubercles like those on the carapace: amid the serrations five large teeth on the outer border of the hand are very conspicuous.

The ambulatory legs are slender and smooth.

The epistome is sculptured, and is very deeply excavated in the middle line.

The pterygostomian region is traversed by a canal running parallel with the buccal frame: the canal is perfectly smooth, and is closed below, and thus converted into a tube, by thick fringes of long hairs.

I believe, with Ortmann, that this species is very probably identical with *L. pisoides*, Adams and White ('Samarang' Crustacea, p. 28, pl. v. fig. 4), and perhaps with *L. diacanthus* de Haan (Faun. Japon. Crust., p. 92, pl. xxiii. fig. 1).

It is a fairly common species at the Andamans and Nicobars.

Lambrus (*Aulacolambrus*) *hoplonotus*, Ad. & Wh.

Lambrus hoplonotus, Adams and White, 'Samarang' Crust., p. 35, pl. vii. fig. 3.

Lambrus hoplonotus, A. Milne-Edwards, Nouv. Archiv. du Mus., VIII. 1872, p. 258.

Lambrus hoplonotus, Miers, Ann. Mag. Nat. Hist., 1879, Vol. IV. p. 22; and 'Challenger' Brachyura, p. 98.

Lambrus hoplonotus, Haswell, P. L. S., N. S. Wales, Vol. IV. 1879, p. 450; and Cat. Austral. Crust., p. 33.

Carapace with the outline in front of the huge lateral epibranchial spine almost semi-circular, the rostrum being extremely short and not breaking through the general outline. The carapace is granular, and has the regions well-defined but not elevated.

The symmetrically rounded antero-lateral margin is regularly festooned with little round teeth of uniform size, and ends at a great projecting lateral epibranchial spine: behind and internal to this spine is another small spine: the posterior border is finely granular. The chelipeds, legs, and margins of the carapace are fringed with long hairs; and the pterygostomian region is channelled just as in *L. sculptus*.

The chelipeds in the male are a little more, and in the female a little less than three times the length of the carapace: the arms and hands are depressed trigonal, and the fingers small: the *arm* has its inner edge sharply tuberculate, its outer edge strongly 4 or 5-spinate, its lower edge beaded, its upper surface with a row of 4 or 5 large granules: the *wrist* has three strong spines along its outer edge: the *hand* has its inner edge sharply 9 to 11-dentate, its outer edge very strongly 6 to 8-spinate, with small spinules alternating with the large spines, and its lower edge sharply and finely beaded. The ambulatory legs are perfectly smooth.

All our specimens are typical according to Adam and White's figure. This species is common at the Andamans.

Lambrus (Aulacolambrus) curvispinis, Miers.

Lambrus curvispinis, Miers, Ann. Mag. Nat. Hist., Vol. IV. 1879, p. 24; and 'Challenger' Brachyura, p. 98.

This species, which Miers in his latest notice of it considers to be one of the numerous varieties of *L. hoplonotus*, resembles the latter species in every particular except (1) that the rostrum ends in a little bacillar spinule; (2) that the antero-lateral borders of the carapace instead of being crenate are powerfully spinate; (3) that the spines along the inner edge of the palm are strongly hooked upwards and outwards; and (4) that the inner surface of the arm bears a row of spinules.

This species, or variety, which is twice the size of *L. hoplonotus*, is also very common at the Andamans.

Lambrus (Aulacolambrus) whitei, A. M.-Edw.

Lambrus carinatus, Adams and White (*nec* Edw.), 'Samarang' Crust., p. 27, pl. v. fig. 3.

Lambrus whitei, A. Milne-Edwards, Nouv. Archiv. du Mus., VIII. 1872, p. 260; and Miss. Sci. Mex. Crust., I. p. 147 (foot-notes).

Lambrus whitei, Miers, 'Challenger' Brachyura, p. 98.

In the form of the carapace, the hairiness of the edges of the legs and carapace, and in the presence of the pterygostomian canal, this species almost exactly resembles the two preceding species.

The antero-lateral borders are sharply crenulate and end at a large outwardly and backwardly directed spine, internal to which is another largish spine; while on the posterior border are four largish spines. The carapace is granular, and in the middle line are two conical spines, one on the gastric the other on the cardiac region, while on either branchial region are two similar spines.

The spinature of the chelipeds is, in disposition, similar to that of *L. hoplonotus*, but the spines, especially those on the outer edge of the hand, are very much longer, slenderer, and more acute.

Several specimens, including ovigerous females, of this small species are in the Museum collection, from Arakan; and from off Ceylon, 34 fathoms.

The figure in Adams and White is an admirable illustration of this species.

Sub-genus PARTHENOLAMBRUS, A. M.-Edw.

Parthenolambrus, A. Milne-Edwards, Miss. Sci. Mex. Crust., I. p. 148.
Parthenopoides, Miers, Journ. Linn. Soc., Zool., Vol. XIV. 1879, p. 672.
Parthenolambrus, Miers, 'Challenger' Brachyura, p. 99.

Carapace semi-elliptical or semi-circular, with a nearly straight posterior margin, the postero-lateral angles being strongly produced. Chelipeds of no great length, never sharply serrate, and with the arms and hands indefinitely contorted. The rostrum is more or less deflexed.

Key to the Indian species of the sub-genus Parthenolambrus.

I. Carapace with the hepatic regions very prominent in the antero-lateral margin:—
  1. Carapace broader than long, strongly convex, nodular and eroded: chelipeds less than twice the length of the carapace ...... *L. tarpeius.*
  2. Carapace as long as broad, compressed, with cristiform edges, its surface almost devoid of granules: chelipeds more than twice the length of the carapace ...... *L. harpax.*

II. Carapace with the hepatic regions distinct, but not markedly prominent:—
  1. Rostrum almost vertically deflexed: ambulatory legs *dentate*, but without true spines ...... *L. calappoides.*
  2. Rostrum moderately deflexed, with a prominent median lobe: meropodites of ambulatory legs each with three rows of close sharp spines...... *L. beaumontii.*

Lambrus (*Parthenolambrus*) *calappoides*, Ad. and Wh.

Parthenope calappoides, Adams and White, 'Samarang' Crustacea, p. 34, pl. v. fig. 5.

Lambrus calappoides, Haswell, P. L. S., N. S. Wales, Vol. IV. 1879, p. 452; and Cat. Austral. Crust., p. 35.

Lambrus calappoides, Miers, Zoology of H. M. S. 'Alert,' pp. 517 and 527; and 'Challenger' Brachyura, p. 101.

Parthenolambrus calappoides, R. I. Pocock, Ann. Mag. Nat. Hist., 1890, Vol. V. p. 75.

Carapace almost semi-circular in outline, with an indentation behind the hepatic regions: the regions are well-delimited, but not carinated or sharply raised; and the surface is granular without any very large spines or nodules. The rostrum is deflexed almost vertically. The eyes are sunk in deep orbits with swollen margins. The antero-lateral margins, and sometimes the postero-lateral, are closely festooned or incised, but in an irregular manner.

On either side of the gastric region is a deep hollow; and on either side of the front part of the cardiac region is a deep foramen.

The chelipeds in the male are not twice the length of the carapace: the arm is coarsely spinate along its convex inner border, and the hand still more coarsely and bluntly spinate along its contorted upper border.

Ambulatory legs compressed, the 3rd to 5th joints having the edges irregularly dentate, this being most marked in the case of the last pair.

The animal as a whole has a sort of boiled appearance.

The species is very variable, and owing to frequent and extensive incrustation with barnacles, foraminifera, etc., is very hard to describe.

In the Museum collection are specimens from the Andamans, Mergui, Arakan, Ceylon, and Malabar coast.

Lambrus (*Parthenolambrus*) *beaumontii*, n. sp.

Very near to *Parthenope bouvieri* and *trigona*, A. M.-Edw., (*v.* Rev. et. Mag. Zool. (2) XXI. 1869, pp. 350–353).

This species comes from deepish water, and is small and very variable — the adult female, especially, being so unlike the male, that if it were found apart, it would be considered distinct.

The carapace is semicircular, the curve being broken (1) by the hepatic regions, and (2) by the projecting middle lobe of the rostrum. The elegantly curved antero-lateral borders are closely festooned by a row of thin, sharp, laciniated teeth, the bases of which are fused together; of these teeth the first three, situated on the hepatic region, are smaller than the others, which are of equal size, except the last, and this forms the summit of the salient upcurved postero-lateral angle. The postero-lateral borders are irregularly serrated, and there is a spinule in the middle of the posterior border. The regions of the carapace are very salient and form three cariniform elevations: there is usually, but not always, in the male, and seldom in the female, a recurved spinule on the gastric region, in the middle line; and generally in the male, but seldom in the female, the conical cardiac region is surmounted by one or two spinules.

The rostrum is trilobed, the small lateral lobes being formed each of a group of granules, and the larger, projecting, median lobe being spathulate, smooth, and somewhat deflexed.

The surface of the carapace is somewhat granular and eroded, but this is often concealed by a glazing of stony algæ.

The orbits have the edges finely and evenly serrate. The third joint of the antennal peduncle is spiniferous.

The segments of the sternum, as also the abdominal terga, are all deeply cut, and their surface, like that of the external maxillipeds and pterygostomian regions, is very sharply, closely and evenly granular.

The chelipeds in the male are $2\frac{2}{3}$ times the length of the carapace; in the female hardly twice that length: in both sexes they are top-heavy, owing to the distal enlargement of the palm and the great size of the fingers; they are everywhere granular, but most markedly so on the under surface: the inner border of the arm and palm, and the upper border of the movable finger, are irregularly spinulate, the outer border of the hand may have two or three irregularly disposed blunt teeth, and that of the arm a few spicules. The ambulatory legs characterize this species, for the meropodites, in all, are compressed-trigonal with all three edges strongly, sharply and closely spinate; the anterior, and often also the posterior, margins of the next two joints also are spinate or dentate.

		Male.	Female.
Greatest length of carapace	...	10·5 millim.	9 millim.
" breadth "	...	10·5 "	9 "
Length of chelipeds	...	29 "	15·5 "

Loc. Off Ceylon 32–34 fms., and off the Andamans, 41 fms.

Lambrus (*Parthenolambrus*) *tarpeius*, Ad. and Wh.

Lambrus tarpeius, Adams and White, 'Samarang' Crust., p. 35, pl. vii. fig. 2.
Lambrus tarpeius, Miers, 'Challenger' Brachyura, p. 99.

Carapace covered with numerous large nodules, and with the division into three lobes—a median and two lateral—well-marked. The hepatic region not only projects very strongly forwards, but is brought into greater prominence by the fact that the carapace is somewhat contracted behind the eyes, and excavated and constricted behind the hepatic regions themselves: the antero-lateral margins are crenulate; the produced postero-lateral angle ends in a rounded lobe-like spine, and the posterior and postero-lateral margins are irregularly and bluntly toothed.

The rostrum, which is deeply excavated and considerably deflexed, ends in a blunt point.

The chelipeds are massive and nodular, but even in the male are only about half as long again as the carapace.

The ambulatory legs have the 3rd, 4th and 5th joints compressed and irregularly dentate along one or both edges.

Our specimens, which are rather damaged, come from the Andamans to 20 fathoms, and from off Colombo, 26½ fathoms.

Lambrus (Parthenolambrus) harpax, Ad. and Wh.

Lambrus harpax, Adams and White, 'Samarang' Crustacea, p. 25, pl. vi. fig. 3.

Lambrus harpax, Haswell, P. L. S., N. S. Wales, Vol. IV. 1879, p. 450; and Cat. Austral. Crust., p. 32.

Lambrus harpax, Miers, Zoology H. M. S. 'Alert,' pp. 182 and 202; and 'Challenger' Brachyura, p. 99.

Male. Carapace depressed semi-elliptical, as long as broad, its surface almost smooth. The median region is carinated, the carina bifurcating anteriorly to enclose an elongate-triangular depression behind the eyes, and carrying a large spine in the gastric region (at the point of bifurcation), another large spine in the cardiac region, and a much smaller spine in front of the latter.

The lateral margins are cristiform, with a series of crenations and sutures indicating fused teeth; and the hepatic region is prominent, with a cristiform edge: the postero-lateral angle is surmounted by an upturned laciniated tooth, the postero-lateral margins are dentate, and on the posterior border is a triangular tooth with an obscurely trilobed tip: from the bluntly laciniated tooth of the postero-lateral angle a carina runs obliquely forwards and inwards onto the posterior part of the branchial region.

The rostrum is strongly deflexed, and ends in an obscurely and unevenly trilobed tip. The chelipeds in the male are nearly 2½ times the length of the carapace, and are thin and compressed, with sharp, almost cristiform, edges: in the *arm* both the inner and outer edges are unevenly dentate, and the lower edge faintly granular: the *carpus* has the outer edge compressed and crenulate: the thin *hand* has its inner edge crenulate, has a curved line of granules on its inner surface, and some granules on its outer surface: the movable *finger* has its upper edge crenulated at base. The ambulatory legs are compressed, with the 3rd, 4th and 5th joints cristated above, especially in the last two pairs: in the last pair these joints have both margins rather strongly dentated.

Our specimen is from the Andamans.

Miers (Zoology H. M. S. 'Alert,' p. 202) considers *L. sandrockii*, Haswell (P. L. S., N. S. Wales, Vol. IV. 1879, p. 452, pl. xxvii. fig. 2) to be identical with this species.

PARTHENOPE, Fabr.

Parthenope, Milne-Edw., Hist. Nat. Crust., I. 359, (*v. synon.*)
Parthenope, Miers, Journ. Linn. Soc., Zool., Vol. XIV. 1879, p. 668.

The form and structure of the carapace is somewhat similar to that of *Parthenolambrus*; but the genus is distinguished from *Lambrus* by the nature of the so-called basal antennal joint, which is relatively long, and nearly reaches to the level of the inferior orbital hiatus: the fingers also are much less turned inwards.

Key to the Indian species of the genus Parthenope.

I. Carapace remarkably rugose or spinose: chelipeds nearly of the ordinary *Lambrus* form, and beset with huge spines: ambulatory legs strongly spinate:—
  1. Carapace and chelipeds beset with coarse tubercles and spines: carapace about ¾ as long as broad.. *P. horrida.*
  2. Carapace and chelipeds beset with spines, which are sharp and laciniate on the chelipeds: carapace only ⅔ as long as broad .... *P. spinosissima.*

II. The whole body and all the appendages beset with delicate paxilliform tubercles which unite to form a lace-work or frosting: chelipeds tapering, with long slender spiny fingers, nearly as long as the palm (sub-genus *Parthenomerus*).. *P. efflorescens.*

Parthenope horrida, Fabr.

Rumph, Amboin. Rariteitk. ix. 1.
? Seba, III. xix. 6-7.
Cancer horridus, Linn. Syst. Nat. II. 1047, 43.
? *Cancer horridus*, Herbst, I. ii. 222, tab. xiv. fig. 88.
Parthenope horrida, Fabr., Suppl., 353.
Parthenope horrida, Leach, Zool. Misc., II. 107.
Parthenope horrida, Desmarest, Consid. Crust., p. 143, pl. xx. fig. 1.
[*Parthenope horrida*, Guérin, Icon. R. A., pl. vii. fig. 1.]
Parthenope horrida, Milne-Edwards, Hist. Nat. Crust., I. 360.
Parthenope horrida, Cuv. Regn. An., pl. xxvi. fig. 2.
Parthenope horrida, A. Milne-Edwards, Nouv. Archiv. du Mus., VIII. 1872, p. 255.
Parthenope horrida, Martens, Archiv. fur Naturges., XXXVIII. 1872, p. 86 (note on habitat).
Parthenope horrida, Miers, Phil. Trans., Vol. 168, p. 486.
Parthenope horrida, Nauck, Z. Wiss. Zool., XXIV. 1880, p. 44 (gastric teeth).
Parthenope horrida, C. W. S. Aurivillius, Kongl. Sv. Vet. Ak., Handl. XXIII. No. 4, 1888-89, p. 60.
[*Parthenope horrida*, F. Muller, Verh. Ges., Basel., VIII. p. 473].

Carapace somewhat pentagonal; its length not quite $\frac{3}{4}$ its breadth; its surface deeply eroded, strongly rugose, and sharply tubercular: its postero-lateral angle much produced outwards: antero-lateral margin coarsely spinate: postero-lateral and posterior margins granular, the former with a coarse spine. Rostrum short, moderately deflexed, ending in a blunt inter-antennulary tooth. Orbits circular, deep.

Chelipeds huge, one much larger than the other, the larger twice the length of the carapace (in the female), covered with large coarse granular spines.

Ambulatory legs stout, spiniferous; the dactylus smooth: the meropodite, in all, is compressed-trigonal, with all the edges spinate.

The under surface of the body has a worm-eaten appearance: the sternum is deeply pitted, with a deep crescentic excavation between the chelipeds.

The abdomen (of the female) with a series of deep excavations along either side.

Off Ceylon, 34 fathoms.

Parthenope spinosissima, A. M.-Edw.

Seba, III. xxii. 2 and 3.

Parthenope spinosissima, A. M.-Edw., in Maillard's l'ile Réunion, Annexe F, p. 8, pl. xviii.

Parthenope spinosissima, Alcock, J. A. S. B., 1893, Pt. ii. p. 177.

Carapace in the form of an equilateral triangle, its length only about $\frac{7}{8}$ its breadth; its surface strongly rugose, and sharply tubercular and spinate: the antero-lateral borders are armed with large laciniate spines; the posterior and postero-lateral borders are sharply spinate: the strongly-produced and spinate postero-lateral angle runs forwards as a carina onto the branchial regions.

The three lobes of the gastric region are greatly inflated.

The rostrum is vertically deflexed, and ends in a strong sharp inter-antennulary spine.

The chelipeds are very little asymmetrical, and are beset, nearly up to the tips of the fingers, with great ramose and laciniate spines.

The ambulatory legs are armed with extremely sharp teeth almost up to the tip of the dactylus.

The abdomen of the female has a median double series, and on either side a single series, of sharp spines.

A male and female from the Bay of Bengal, 88 fathoms.

Sub-genus PARTHENOMERUS, *nov.*

Characterized by the chelipeds, which have a thigh-shaped meropodite, and taper to the fingers, which are nearly as long as the palm, and are extremely slender.

Parthenope (Parthenomerus) efflorescens, n. sp.

Carapace triangular, not quite ¾ as long as broad; its entire surface, above and below, as also that of the sternum, of the abdomen (in the female), and of all the exposed appendages—from the eye-stalks to the last pair of ambulatory legs, covered with a lace-work, or frosting, formed by the partial contact of very delicate crisply paxilliform granules. There are no large tubercles, and, except on the arm hand and fingers, no spines. On the arm, namely, there are two or three teeth with acicular tips, on both the lower-inner, and the upper-inner borders; on the hand there are three needle-like teeth on the upper-inner, and three on the lower-inner borders; and the fingers are everywhere beset with long needle-like spines. The rostrum is nearly vertically deflexed.

Only one cheliped remains in our unique specimen; and it, which is a little over twice the length of the carapace, has a most curious tapering form: the meropodite is huge and thigh-shaped, decreasing in size distally; the carpus is slenderer than the end of the meropodite; and the hand is still slenderer than the carpus: the fingers are long—nearly as long as the palm—are extremely slender, and, as already noted, are beset with long slender spines.

A single female, from the Andaman Sea, 36 fathoms.

CRYPTOPODIA, Edw.

Cryptopodia, Milne-Edwards, Hist. Nat. Crust., I. 360.
Cryptopodia, Miers, Journ. Linn. Soc. (Zool.), XIV. p. 669.
Cryptopodia, Miers, 'Challenger' Brachyura, p. 101.

Carapace very broadly triangular, with very large lateral clypeiform vaulted expansions which completely conceal the ambulatory legs, and are prolonged posteriorly far beyond the base of the abdomen; a large space between the gastric and the cardiac regions is triangular and concave. The rostrum is nearly horizontal, spatuliform and very prominent. The pterygostomian regions are smooth, not ridged. The orbits are very small, nearly circular, with a suture in the superior margin. The epistome is well developed; the antennulary fossæ are narrow and somewhat oblique. The abdomen, in the male, is five-jointed; the third to fifth segments coalescent. The eyes are very small and retractile. The basal antennal joint is slightly dilated and does not nearly reach the internal orbital hiatus, which is filled by the second joint. The buccal cavity and external maxillipeds are small. The ischium-joint of the maxillipeds is not produced at its antero-internal angle; the merus is distally truncated, with the antero-external angle slightly produced, the interior margin notched below the antero-internal angle. The chelipeds are nearly as in *Lambrus;* the merus-joint has a wing-like lobe on the posterior margin near to the distal extremity; the palms of the chelipeds are elongated, tricarinated, and dentated (as in *Lambrus*); fingers short. The ambulatory legs are slender, decrease successively but slightly in length, and have the fourth, fifth and sixth joints more or less distinctly carinated; dactyli nearly straight.

Cryptopodia fornicata, (Fabr.)

Cancer fornicatus, Fabr., Ent. Syst., II. 453.
Cancer fornicatus, Herbst, I. ii. 204, pl. xiii. figs. 79–80.
Parthenope fornicata, Fabr., Suppl., p. 352.
Maia fornicata, Latr., Hist. Nat. Crust., VI. 104.
Oethra fornicata, Desmarest, Consid. Crust., p. 110.
Cryptopodia fornicata, Milne-Edwards, Hist. Nat. Crust., I. 362 (*v. synon.*)
Cryptopodia fornicata, de Haan, Faun. Japon. Crust., p. 90, pl. xx. figs. 2 and 2*a*; and (?) Adams and White, 'Samarang' Crust., p. 32, pl. vi. fig. 4; and Dana, U. S. Expl. Exp. Crust., pt. I. p. 140; and Stimpson, Proc. Ac. Nat. Sci., Philad., 1857. p. 220; and Haswell, P. L. S., N. S. Wales, Vol. IV. 1879, p. 454; and Cat. Austral. Crust., p. 37; and E. Nauck, Z. Wiss. Zool., 1880 (gastric teeth); and Miers, Zool. H.M.S. 'Alert,' pp. 182 and 203; and 'Challenger' Brachyura, p. 102; and A. O. Walker, Journ. Linn. Soc., Zool., Vol. XX. 1890, p. 109; and J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 351.

Carapace broadly triangular, depressed: the antero-lateral margins more or less laciniated, the posterior and postero-lateral margins forming one strong curve, the edge of which is either unbroken or shows very faint traces of crenulation: the surface of the carapace is in the main smooth, but the triangular depression is a little pitted and is bounded by lines of granules, the lateral lines being produced well across the branchial regions. The rostrum is prominent, blunt-pointed, about as long as broad, and has its edge very faintly crenulate.

The chelipeds are considerably less than twice the length of the carapace, and have massive sharply trigonal joints, with most of the edges strongly cristiform; and the fingers are massive and strongly incurved as in *Lambrus*: in the *arm*, the cristiform inner and outer edges are sharply laciniate, the latter being strongly alate, while the lower edge is beaded: in the *carpus* the outer edge only is cristiform: in the hand both the inner and outer edges are strongly cristiform and laciniate, the lower edge being crenate.

The ambulatory legs have both edges of the merus raised into spiniform crests, and the upper edges of the next two joints carinate.

In the Museum collection are numerous specimens from Palk Straits, Andamans and Persian Gulf.

Cryptopodia angulata, Edw. and Lucas.

Cryptopodia angulata, Edw. and Lucas, Archiv. du Mus., Vol. II. 1841, p. 481, pl. xxviii. figs. 16–19.

Carapace convex, sharply pentagonal, with all the edges deeply dentated, and all the angles produced to form curved spines; in addition there is a second spine in front of the spine of either antero-lateral angle, and the part of the posterior border that is co-extensive with the abdomen is demarcated on either side by a strong spine. The rostrum ends in a sharp point. The triangular depression of the carapace is very deep, and the lines which bound it are granular; there is an irregular patch of granules on either branchial region, and there is a line of granules passing forwards from the apex of the triangular depression to the base of the rostrum on either side.

The chelipeds are much as in *C. fornicata*, with the exception that the carpus is semi-globular, and that the inner and outer margins both of the hand and arm are armed with sharp laciniate spines. The ambulatory legs have the merus simply carinate above, spinate-carinate below, the carpus and propodite carinate, and the dactylus strongly carinate on both edges so as to form a swimming blade.

Orissa coast, 20–25 fathoms. Malabar coast, 28 fathoms.

In a large male from the Malabar coast, the carapace is much more granular; and the chelipeds have the spinature much more acute and laciniate, and their surfaces—especially the under surface—granular instead of nearly smooth.

Cryptopodia angulata, var. *cippifer*, nov.

In this variety the only differences are: (1) that the semi-globular carpus has a few granules on its upper surface; and (2) that the triangular hollow in the middle of the carapace is rather deeper, and has certain large erect definitely-placed spines on the ridges that bound the hollow, namely,—two close together side by side in the middle line, in front; one at either branchial angle; and one in the middle line posteriorly, on the summit of the cardiac region.

These spines are present in six specimens of both sexes, but are most pronounced in the male.

Loc. Karáchi.

The largest specimen, female, has an extreme breadth of carapace of 45 millim.

HETEROCRYPTA, Stimpson.

Heterocrypta, Stimpson, Ann. Lyc. Nat. Hist., New York, Vol. X. 1874, p. 102.

Heterocrypta, A. Milne-Edwards, Miss. Sci. Mex., Crust., I. p. 166.

Heterocrypta, Miers, J. L. S., Zool., Vol. XIV. 1879, p. 669; and 'Challenger' Brachyura, p. 102.

Differs from *Cryptopodia* in the following characters :—

The posterior border of the carapace slightly overlaps the abdomen, but is not distinctly produced ; the lateral clypeiform expansions are also less produced, so that the legs when even moderately extended can be seen beyond them.

The pterygostomian and sub-hepatic regions are traversed by a granular ridge which runs parallel to the antero-lateral border from the angle of the buccal cavity to the base of the chelipeds.

Heterocrypta investigatoris, n. sp.

Carapace broadly pentagonal ; the posterior border almost straight, and crenulated ; the other borders sharply dentate. The central depression of the carapace is semi-circular and very deep, with the boundary raised into a carina : the horns of the semi-circle end each in a boss or mammillary tubercle, from which a carina runs backwards to the posterior angle of the carapace. The rostrum is very large and prominent, shaped like a leaf : its surface is smooth : that of the carapace is either smooth or granular—the granules, when present, being most abundant on the posterior part of the branchial regions.

The chelipeds, which are twice the length of the carapace, have both the inner and outer edges of the *arm* sharply dentate (but not alate as in *Cryptopodia*), and the lower edge beaded : the *carpus* is subglobular : the *hand* has both the inner and the outer edges bluntly dentate, and the under surface closely covered with bead-like granules.

The ambulatory legs have the upper edges of the 3rd, 4th, and 5th joints sharply carinate : the meropodite also, in the case of the first two pairs of legs, has a single row of teeth or spines along its lower edge, and in the case of the last two pairs of legs has a double row of spines along the lower edge.

Like all the species of this genus, this species is small, the breadth of the carapace in the largest specimen being 18 millim.

It is not uncommon off rocky parts of the coasts of India up to and about 30 fathoms. It would seem to be allied to the *Cryptopodia contracta* of Stimpson (Proc. Ac. Nat. Sci., Philad., 1857, p. 220).

OETHRA, Leach.

Oethra, Leach.
Oethra, Milne-Edwards, Hist. Nat. Crust., I. 370.
Oethra, A. Milne-Edwards, Miss. Sci. Mex., Crust., I. p 170 (*v. synon.*).
Oethra, Miers, Journ. Linn. Soc., Zool., Vol. XIV. 1879, p. 669.

The carapace is regularly oval (transversely), with its surface strongly rugose, and its antero-lateral edges somewhat upturned. The rostrum is obsolete, not breaking the general oval outline. The eyes are small; and the orbits are nearly circular, with two sutures in the upper border, and a hiatus at the inner inferior angle, which is filled by the second joint of the antennary peduncle.

The antennulary fossæ are squarish, and are nearly filled by the large angular basal joint, internal to which the rest of the antennule folds obliquely.

The basal antennal joint is oblong and angular, and reaches to the internal orbital canthus: the antennary flagella are rudimentary.

The external maxillipeds completely close the buccal frame: their inner border is extremely straight and sharp cut: their palp is inserted at the antero-internal angle of the merus, and folds out of sight.

The chelipeds are about equal in length to the carapace: they have somewhat the *Lambrus* form—having sharply prismatic joints and large inturned fingers, but are concave on the upper surface.

The ambulatory legs are short, and decrease gradually in length: they are all strongly dentate-carinate, or cristate.

The abdomen of the female (and young male) consists of seven segments.

Oethra scruposa, L.

[*Cancer scruposus*, Linn., Mus. Lud. Ulr., p. 450.]
Cancer polynome, Herbst, III. ii. 23, tab. liii. figs. 4-5.
[*Oethra depressa*, Lamk., Hist. Anim. Sans. Vert., V. 265.]
Oethra depressa, Desmarest, Consid. Crust., p. 110, pl. x. fig. 2.
[*Oethra depressa*, Guérin, Icon. R. A., pl. xii. fig. 3.]
Oethra scruposa, Milne-Edwards, Hist. Nat. Crust., I. 371.
Oethra scruposa, Cuv., R. A., pl. xxxviii. fig. 2.
Oethra scruposa, Stimpson, Proc. Ac. Nat. Sci., Philad., 1857, p. 221.
Oethra scruposa, A. M.-Edw., in Maillard's l'île Réunion, Annexe F., p. 3; and Nouv. Archiv. du Mus., VIII. 1872, p. 263.
Oethra scruposa, Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 351.
[*Oethra scruposa*, F. Muller, Verh. Ges., Basel, VIII. 473.]

(*Oethra scruposa*, var. *scutata* A. Milne-Edwards, Miss. Sci. Mex., Crust., I. p. 170, pl. xxxi. fig. 2 = *Oethra scutata*, S. I. Smith, Amer. Journ. Sci., etc., XLVIII. 1869, p. 120; and Ann. Mag. Nat. Hist., 1869, Vol. IV. p. 230, is considered by M. A. Milne-Edwards to be only a variety of the Linnæan type.)

The antero-lateral borders are divided into 6 or 7 indistinct lobes by deep narrow sutures, each fold being again subdivided near the edge by a faint crest.

The gastric region is extremely prominent, and is divided into two lobes by a broad longitudinal channel, each lobe being sparsely granular: the branchial regions are also somewhat convex near their middle, the convexities being granular: the rest of the carapace is somewhat concave.

The chelipeds and ambulatory legs are rough: the chelipeds have the lower edge sharply dentate, and the outer edge of the carpus sharply dentate: the ambulatory legs have the 3rd, 4th and 5th joints carinate or cristate above, and the 3rd and 5th joints cristate below: the dactyli are cristate on both edges, and end in little claws.

The abdomen is deeply sculptured.

In the Museum collection is a male from the Andamans, and a female from Ceylon.

Sub-family II. EUMEDONINÆ, Miers.

Miers, Journ. Linn. Soc., Zool., Vol. XIV. 1879, p. 670.

Carapace rhomboidal or pentagonal, with a spine at the junction of the antero-lateral and postero-lateral borders. Rostrum usually bifid or emarginate. Surface of carapace nearly flat. Chelipeds of moderate size and length.

Key to the Indian genera of the sub-family EUMEDONINÆ.

I. Floor of the orbit not in contact with the front, but leaving a hiatus which is more or less filled by the second joint of the antennal peduncle. Chelipeds armed with large spines: ambulatory legs compressed:—

  1. Spine of antero-lateral angle of carapace directed forwards.. ZEBRIDA.

  2. Spine of antero-lateral angle directed straight outwards; last pair of legs dorsal in position... EUMEDONUS.

II. Floor of the orbit meeting the front, so as to completely exclude the antennal peduncle from the orbit: chelipeds not armed: ambulatory legs not compressed.................. CERATOCARCINUS.

ZEBRIDA, Adams and White.

Zebrida, Adams and White, 'Samarang' Crustacea, p. 23.
Zebrida, Miers, J. L. S., Zool., Vol. XIV. 1879, p. 670.

Carapace sub-rhomboidal, flattened, with the rostrum formed by two large, acute, laminar, almost parallel teeth; and with the antero-lateral angles produced to form two similar laminar teeth projecting forwards in a plane parallel to the rostrum.

Orbits circular, their inner canthus being filled by part of the antennal peduncle.

The antennules fold obliquely. The antennæ are entirely concealed beneath the rostrum: their flagellum is well developed; and their basal joint is longish, reaching to the inner canthus of the orbit.

The chelipeds are stout but short, the legs are compressed, and both are armed with large laminar spines of the same type as those that form the rostrum and the antero-lateral margins of the carapace. The ambulatory legs are subchelate much as in *Acanthonyx*.

Zebrida adamsii, White.

Zebrida adamsii, White, P. Z. S., 1847, p. 121; and Ann. Mag. Nat. Hist., 1848, Vol. I. p. 223; and 'Samarang' Crustacea, p. 24, pl. vii. fig. 1.

Zebrida adamsii, J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 351.

Zebrida longispina, Haswell, P. L. S., N. S. Wales, Vol. IV. 1879, p. 454, pl. xxvii. fig. 3; and Cat. Austral. Crust., p. 38.

Body of a light delicate madder pink, the carapace with darker (liver-coloured) parallel longitudinal bands and alternating streaks, the legs and chelipeds with broad somewhat oblique cross-bands of the same darker colour: the median longitudinal dark band, and a band on either side of it, extend, discontinuously, from the carapace along the abdomen.

The entire integument of the body and limbs is smooth, hard, and polished. The chelipeds are stout, with short squat joints: the *arm* is trigonal with sharp-cut laminar edges, the upper and lower of which end in sharp teeth; its broad distal end is also dentate: the *wrist* is surmounted by three laminar teeth disposed in a triangle: the *hand* has its upper edge raised into a compressed tooth.

Of the ambulatory legs the 3rd, 4th, and 5th joints are strongly compressed, with the upper edges sharply and acuminately carinate; the fifth joint is enlarged distally, and the strongly recurved dactylus is retractile against it in the manner of a subchela.

In the Museum collection are a male and female from the coast of Travancore.

EUMEDONUS, Edw.

Eumedonus, Edw., Hist. Nat. Crust., I. 349.

Eumedonus, Miers, J. L. S., Zool., Vol. XIV. 1879, p. 670.

Carapace depressed, pentagonal: rostrum large, strongly prominent, bifurcate only near the tip. Orbits circular; their internal hiatus occupied by part of the antennal peduncle. Antennules folding obliquely; their basal joint of large size.

Antennæ entirely concealed beneath the front; both the peduncle and the flagellum short. Chelipeds more massive than the other legs, and in the male much longer; armed with large spines. Ambulatory legs compressed; their third joint cristate; the second pair a little shorter than the third; the fifth pair dorsal in position. The abdomen in both sexes consists of seven separate segments.

Eumedonus zebra, n. sp.

Carapace, in spirit, of a yellow colour, and traversed fore-and-aft by five broad parallel liver-coloured bands—a median and two lateral: the median and the inner lateral band on either side being continued a certain distance on to the abdomen.

The carapace is sharply pentagonal, the antero-lateral angles being sharp and directed straight outwards.

The rostrum forms a long, broad, sub-triangular lamina bifurcated near the tip.

The chelipeds in the female are about the same length as the carapace: the ischium has a sharp tooth on its inner border, the merus has one on its inner and one on its upper margin, the carpus has a very strong one on its upper border, and the hand has two on its upper border: the legs have the merus strongly compressed, with the upper border dentate or cristate, and the dactyli are strongly recurved.

Two ovigerous females from off Ceylon, 32 fms: the extreme length of the carapace of the larger specimen is 10 millim.

CERATOCARCINUS, Adams and White.

Ceratocarcinus, Adams and White, Proc. Zool. Soc., p. 57, 1847; and 'Samarang' Crust., p. 33.

Ceratocarcinus, Miers, Journ. Linn. Soc., (Zool.) XIV. p. 670, 1879; and 'Challenger' Brachyura, p. 104.

Carapace sub-hexagonal, about as broad as long, with the dorsal surface nearly flat, spinose or tuberculated. The spines of the rostrum are elongated, acute, and separated by a rather wide interspace, and there is a well-developed lateral epibranchial spine. The orbits are small and circular, and the sub-ocular lobe joins the front, so as completely to exclude the antennæ from the orbits. The basal joint of the antennæ is slender and like the greater part of these appendages is hidden beneath the front. The external maxillipeds are small, the ischium-joint not produced at its antero-internal angle, the merus distally truncated, not produced at the antero-external angle, and scarcely emarginate at the antero-internal angle, where the next joint articulates. The chelipeds are relatively slender and somewhat elongated, with the joints not dilated, the merus and carpus sometimes armed with spines; the dactyli acute and shorter than the palms; the ambulatory legs are slender, with the joints not dilated, the merus sometimes armed with a distal spine; the dactyli nearly straight.

Ceratocarcinus longimanus, Ad. and Wh.

Ceratocarcinus longimanus, White, P. Z. S., 1847, p. 57; and Ann. Mag. Nat. Hist., 1847, Vol. XX. p. 62; and 'Samarang' Crustacea, p 34, pl. vi. fig. 6.

Ceratocarcinus longimanus, Miers, 'Challenger' Brachyura, p. 105.

Carapace hexagonal: the spines of the rostrum far apart: lateral angles of the carapace in the form of stout outstanding spines the tips of which are turned forwards: a pair of sharp tubercles in the middle line behind the rostrum—these being tufted with hairs.

Chelipeds stout, about twice the length of the carapace and rostrum, finely granular, and longitudinally grooved.

A single specimen of this small species, from the Malacca Straits, is in the Museum Collection.

Appendix to sub-family ACANTHONYCHINÆ.

MENÆTHIOPS, n. gen.

Closely allied to *Menæthius.*

Carapace pyriform, its surface smooth beneath a pubescent covering. The rostrum consists of two acute slender spines of moderate length, which are in the closest contact throughout.

The eyes, which are movable forwards but not retractile, are in great part concealed beneath a large, very conspicuous, laminar supraocular spine. No post-ocular spine. [A spinule is present on the ventral aspect of the hepatic region of the single species.] The basal antennal joint is broad; and the mobile portions of the antennæ are visible, from above, on either side of the rostrum.

The external maxillipeds have the merus as broad as the ischium, and the palp inserted at the antero-internal angle of the merus.

The ambulatory legs, of which the first pair are longer than the rest, have strongly recurved prehensile dactyli.

The chelipeds in the female (male unknown) are not enlarged.

The abdominal segments in the female appear to be all distinct.

This genus has a superficial resemblance to *Oregonia*, Dana; but in *Oregonia* there is a large post-ocular spine, quite distinct from the hepatic angle, and the eyes are said to be retractile against this spine.

Menæthiops bicornis, n. sp.

Body and legs tomentose, with additional long scattered setæ.

Carapace pyriform, somewhat *Achæus*-like in shape, there being a slight constriction behind the eyes, and another slight constriction behind the hepatic regions: the gastric and cardiac regions very prominent, the branchial regions prominent: the surface, when denuded, smooth, except for a granular ridge on the pterygostomian regions; the hepatic regions are laterally rather prominent, and carry a small spinule visible from above, on the ventral aspect of the antero-external angle, as well as a much smaller spinule on the dorsal aspect. There is also a spinule, in the middle line, on the gastric region, and one on the cardiac region, as well as one near the middle of either branchial region.

The rostrum consists of two slender acute spines, which are about one-fourth the length of the carapace proper, and are in the closest contact up to the very tips.

The eyes are movable forwards but are quite non-retractile backwards, and are in great part concealed beneath a large laminar supra-ocular spine, which has its anterior angle produced forwards and its posterior angle produced outwards. No post-ocular spine.

[The spinule on the ventral surface of the hepatic angle is in no sense a post-ocular spine.]

The basal antennal joint is broad and has its outer edge irregularly wavy, somewhat as in Dana's figure of *Oregonia gracilis* (U. S. Expl. Exp., Crust., I. pl. iii, fig. 2*b*.) ; it sharp antero-external angle is, like the following joints and the flagellum, plainly visible, from above, beside the rostrum: the mobile portion of the antenna is rather more than half the length of the carapace and rostrum.

The chelipeds in the female are not stouter than the other legs, and are shorter than the carapace and rostrum: their palm is nearly twice the length of the fingers, which meet only at the tip.

The ambulatory legs all have slender joints and a strongly recurved prehensile dactylus: the first pair, which are the longest, are, in the female, a little longer than the carapace and rostrum.

A single egg-laden female has the following dimensions :—

Length of carapace and rostrum	6·2 + 2 = 8·2	millim.
Greatest breadth of carapace	6·0	"
Length of chelipeds	7·0	"
Length of first ambulatory legs	8·5	"

Loc. Kárachi.

The place of the above genus in the "Key to the Indian genera of the sub-family *Acanthonychinæ*" (pp. 190 and 191 *ante*), is with *Huenia* and *Menæthius*, from both of which it is easily diagnosed (1) by the *Pisa*-like rostrum, consisting of two sharp slender spines in the closest contact throughout their extent, and (2) by the large antennary flagellum and by the eroded outer edge of the basal antennal joint. It has, indeed, the closest natural relations with *Menæthius*.

The unique specimen has only just been received along with the "Investigator" collections of the season 1894-95.

EXPLANATION OF PLATES.

PLATE III.

Fig. 1. Lambrachæus remifer, ♂.
„ 2. Physachæus ctenurus, ♂ ; 2*a*. abdomen of ♀ × 4 ; 2*b*. abdomen of ♂ × 4.
„ 3. Physachæus tonsor, ♀
„ 4. 4*a*. Grypachæus hyalinus, ♀.

PLATE IV.

Fig. 1. 1*a*. Inachoides dolichorhynchus, ♂.
„ 2. 2*a*. Apocremnus indicus, ♂.
„ 3. Naxia investigatoris, ♂.
„ 4. Macrocœloma nummifer, ♂.
„ 5. Maia gibba, ♂.

PLATE V.

Fig. 1. Achæus cadelli, ♂.
„ 2. 2*a*. Chorilibinia andamanica.
„ 3. Callodes malabaricus, ♀.
„ 4. 4*a*. Paratymolus hastatus, ♀.

On Polarisation of Electric Rays by Double Refracting Crystals.—By PROF. J. C. BOSE, B.A., (CANTAB.) B. SC. (LOND.)

[Read 1st May.]

Plate VI.

A ray of ordinary light incident on a crystal of Iceland spar is generally bifurcated after transmission, and the two emergent rays are found polarised in planes at right angles to each other. The object of the present inquiry is to find natural substances which would polarise the transmitted electrical ray. It was thought that the analogy between electric radiation and light would be rendered more complete, if the classes of substance which polarise light were also found to polarise the electric ray. The identity of the two phenomena may be regarded as established, if the same specimen is found to polarise both the luminous and electric rays.

As the wave length of an electrical ray is very large compared with that of visible light, one would think very large crystals, much larger than what occur in nature, would be required to show polarisation of electric rays. By working with electric radiations having very short wave lengths, I have succeeded in obtaining very satisfactory results with crystals of moderate size. These experiments show that certain crystals are double refracting as regards electric rays, and that they polarise the transmitted beam. With the help of a rudely constructed apparatus, I was able last year to detect traces of these effects. The apparatus has since been improved in detail; it is now possible to detect the polarisation effects with certainty.

The usual optical method of detecting the bi-refringent action of crystals, is to interpose the double refracting structure between two crossed Nicols. The interposition of the crystal generally brightens the dark field. This is known as the depolarising effect, and is regarded as a delicate test for double refracting substances. There is however, no depolarising effect, when the principal plane of the crystal coincides with the polarisation planes of either the polariser or analyser. The field also remains dark, when the optical axis of the crystal is parallel to the incident ray.

A similar method was adopted for experimenting with polarised electric radiation. The electric ray is first polarised by a wire grating. A similar grating acts as an analyser. The two gratings are crossed, and the crystal to be examined is interposed. The Receiver is a modified form of 'Coherer' with its associated Voltaic cell and Galvanometer. Brightening of the field is indicated by a throw of the Galvanometer needle.

APPARATUS USED.

Radiator.—A small Ruhmkorff's coil is used for the production of oscillatory discharges between two small metallic spheres, the diameter of each sphere being 1·5 c. m. The choice of a coil to produce electric oscillation has been a matter of necessity. I obtained oscillatory effects with ease and certainty by using a small influence machine of the Replenisher type. But in the damp atmosphere of Calcutta, the satisfactory working of such a machine is a matter of great difficulty, at least for the greater portion of the year. I had therefore to abandon the influence machine with regret, and to use a Ruhmkorff's coil instead. This coil caused me the greatest trouble. The discharge would of a sudden cease to be oscillatory; after a great deal of coaxing it would work satisfactorily just for a short time. The only coil I could get, was a badly constructed one, with defective insulation. I made it serviceable by changing the condenser and improving the vibrator. By looking to many points of detail I succeeded in making the apparatus work with fair uniformity for several hours. It must be borne in mind that the Receiving apparatus also requires careful adjustment.

Among the possible causes of unsteadiness may be mentioned the following—

1st. The current actuating the coil may vary after a time. To overcome this difficulty a fairly constant battery was made to charge a small storage cell, and a derived circuit from this cell was led to the Primary coil.

2nd. The interrupter may have its rate of vibration changed by heating, wearing out of contact points, and other causes. Any change in the periodicity of the vibrator is at once made evident by the corresponding change in the pitch of the note given out by the vibrator.

3rd. The sparking balls may have their surfaces roughened by the disintegrating action of the spark. To avoid this difficulty, the balls were thickly coated with deposit of gold, and were turned round at intervals to expose fresh surfaces.

The coil with a storage cell is enclosed, with the exception of a horizontal tubular opening, inside a metallic box, not dissimilar in appearance to an Optical Lantern. The interrupter is actuated by turning a key from outside. The sparking balls are at one end of a brass tube 25 c.m. long and 5 c.m. in diameter. At the further end of the tube is the Polariser. Inside the tube is placed a convex lens with the spark gap at its principal focus. With the help of the lens and suitable diaphragms, the electrical beam is made approximately parallel. By means of an Iris diaphragm, the amount of radiation may be varied.

Polariser.—The success of the experiment depends greatly on the care with which the Polariser and Analyser are constructed. Fine copper wire ·2 m. m. in diameter is carefully wound in parallel lines, round two thin sheets of mica. There are about 25 lines for every centimetre. The mica pieces are then immersed in melted paraffin, and the wires thus fixed *in situ*. By cutting round, two circular pieces, containing the gratings are obtained. The mica pieces are too thin to produce any disturbing effect. The gratings are fixed with wires parallel, at the ends of a tube 5 c.m. long. This Polariser tube rotates inside the outer end of the tube which sends out the parallel electric beam.

Analyser.—The Analyser is similar in construction to the Polariser. It rotates inside the Receiving tube, which contains the sensitive surface for detecting radiation.

Receiver.—The Receiving apparatus consists of a 'Coherer' with a Voltaic cell and Galvanometer in series. The Coherer is modified from its usual tubular form. The filings, a single layer thick, are spread over a large surface. This arrangement secures great sensitiveness. A pair of insulated wires from the ends of the Coherer, are led out to a distant dead-beat Galvanometer of D'Arsonval type in series with a constant cell. The leading wires are shielded from radiation by enclosing them inside two coatings of tin foil, along the whole length. As an additional precaution the Galvanometer is also enclosed in a metallic case, with a slit in front of the Galvanometer mirror. A spot of light reflected from the mirror is received on a scale. By adjusting the electromotive force of the circuit, the sensitiveness may be increased to any extent desirable.

When the Analyser and Polariser are properly constructed, and the two exactly crossed, no radiation will reach the sensitive surface, and the Galvanometer will remain unaffected. The field is then said to be dark. But any slight rotation of either Polariser or Analyser, will partially restore the field, and the spot of light will sweep across the scale.

METHOD OF EXPERIMENT.

The spark gap 2 m.m. in length is adjusted in a line inclined at 45° to the horizon. The wires of the Polariser are placed at right angles to this line. The transmitted beam is then plane polarised, its plane of vibration being inclined at 45° to the horizon. The Analyser is now adjusted in a crossed position. On starting the electric vibration, by closing the Ruhmkorff's coil circuit, the Galvanometer remains unaffected. The crystal to be examined is now interposed with its principal plane vertical.

The Geological Department of India kindly lent me a large number of crystals for examination, for which I have to express my thanks. Out of a large number of experiments, I give below an account of some typical cases.

Rhombohedral System.—1° *Beryl.*—The first piece experimented on was a large crystal of Beryl. It is a Hexagonal prism with basal planes. The specimen examined has each face 11 × 5 c.m. The three axes lying in the same plane are inclined at 60° to each other, the fourth axis which is also the optical axis, is at right angles to the plane containing the other three. This crystal was optically opaque.

On interposing this block with its principal plane vertical, the Galvanometer spot flew off the scale. The crystal had thus produced the well known depolarising action. The crystal was now gradually inclined till its principal plane coincided with the polarising plane of the Polariser. There was now no action on the Galvanometer. On continuing the rotation the Galvanometer at once responded. The spot became quiescent a second time, when the principal plane coincided with the polarisation plane of the analyser.

The crystal was now placed with its optic axis parallel to the direction of the incident ray. There was no action on the Galvanometer. Rotation of the crystal round this axis, did not produce any effect on the Galvanometer. The field continued to be dark.

2° *Apatite.*—This specimen exhibited decided double refraction.

3° *Nemalite.*—This is a fibrous variety of Brucite. This specimen exhibited a very strong depolarisation effect. It also exhibited certain interesting peculiarities which will form the subject of a future communication.

Rhombic system.—A large piece of Barytes was found strongly double refracting.

Triclinic system.—Microcline, a greenish blue crystal of the double oblique type, exhibited polarisation effect to a remarkable degree.

Regular system.—A large crystal of Rock-salt was taken. This as was expected did not produce any effect.

Having satisfied myself of the fact that systems of crystals other than regular, produce double refraction and consequent polarisation of electrical ray, I tried the action of electric radiation on crystals ordinarily used in optical experiments.

I got a fairly large piece of black Tourmaline. On interposing this with its plane vertical, there was prompt movement of the spot of light. There was no action on the Galvanometer, when the principal plane coincided with the planes of polarisation of either the Polariser or Analyser.

With ordinary light a piece of Tourmaline of sufficient thickness absorbs the ordinary, but transmits the extraordinary ray. With the piece of Tourmaline used in the last experiment I found both the rays transmitted, but, it seemed to me, with unequal intensities. In other words, one ray suffers greater absorbtion than the other. It seems probable that with greater thickness of crystal one ray would be completely absorbed. I found other crystals behaving more or less in the same way. I reserve for another communication particulars of experiments bearing on this subject.

Lastly I tried an experiment with a crystal of Iceland spar, taken out of a Polarising apparatus. With this I got distinct depolarising action.

The above results, with the exception of the last, were obtained with uncut specimens. Their faces were often rough and irregular. Better results, were they needed, could no doubt be obtained by judicious cutting and polishing the faces.

Summary.—It will thus be seen that crystals which do not belong to the Regular system, polarise the electric ray, just in the same way as they do a ray of ordinary light. Theoretically all crystals, with the exception of those belonging to the Regular system, ought to polarise light. But this could not be verified in the case of crystals opaque to light. There is no such difficulty with electric rays, for all crystals are transparent to them. As a matter of fact, all the above experiments with one exception were performed with specimens opaque to light.

Explanation of the plate

R ... metallic box containing the Ruhmkorff's coil.
S ... position of the sparking balls.
L ... position of the convex Lens.
P ... the Polariser.
I ... Iris diaphragm.
K ... the Crystal.
A ... the Analyser.
C ... the Coherer.
G ... the Galvanometer. In practice the Galvanometer is placed at a greater distance and the leading wires enclosed in tin-foil.

Description of a New Species of Oxyrhynch Crab of the Genus Parthenope.

—By A. Alcock, M. B., C. M. Z. S., *Superintendent of the Indian Museum.*

[Read 3rd July.]

The species here described is a true *Parthenope* as delimited by Miers, Journ. Linn. Soc., Zool., Vol. XIV. 1879, p. 668.

PARTHENOPE INVESTIGATORIS, n. sp.

Carapace almost equilaterally triangular, the sides very slightly curved: its surface is deeply eroded and rugose as in *P. horrida* and *spinosissima*, but is almost devoid of the sharp tubercles found in those species: the antero-lateral borders are slightly crenulate: the produced postero-lateral angle is rounded and nearly smooth: the posterior border bears five small eroded lobules —— a very small one in the middle line, with two larger ones on either side —— with intervening granules. The gastric region is enormously inflated as in *P. spinosissima*, and descends almost vertically to the vertically deflexed rostrum, the latter being fused with the interantennulary tooth. The hepatic regions are rounded laterally, not strongly angulated as they are in *P. horrida* and *spinosissima*. The external maxillipeds, when closed, have the inner edges in the closest contact throughout.

The chelipeds have the *merus* very short and squat —— its breadth about two-thirds of its length —— with two compressed teeth on its short anterior (inner) border, a few blunt teeth followed by a blunt lobe on its posterior (outer) border, a strong tubercle in the middle of its upper surface, and numerous pearly tubercles and nodules on its lower surface: the *carpus* is granular and pustular: the *hand* has five sharp almost equal sized teeth on the lower border (two of them being on the immobile finger), several large nodules on the outer surface, and several large unequal sized spiny lobules on its inner surface: the *mobile finger* is spiny.

The ambulatory legs are compressed: the *merus* is compressed-trigonal, with the edges, especially the anterior edge, spiny: the *carpus* is indistinctly nodular: the *propodus* is also slightly nodular, with a few spinules on its posterior margin: the *dactylus* is closely covered with spinules up to its tip.

The sternum, in the female, is excavated between the chelipeds.

The abdominal terga, in the female, are raised into strong quadrangular convexities down the middle line, and on either side near the edge.

Loc.—Pedro Shoal, ? depth; and Laccadives, 28 fms.

Length of carapace of largest specimen (female) 45 millim., greatest breadth 61 millim.

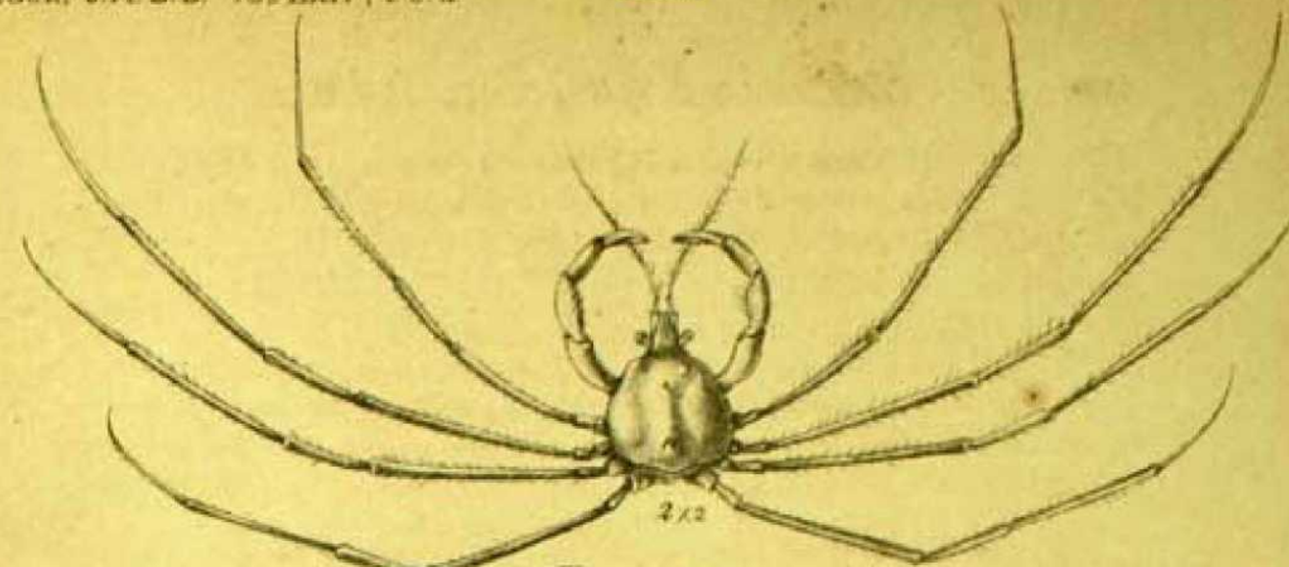
The position of the above species in the *key to the Indian species of the genus* Parthenope, page 279 *ante* is thus shown:—

I. Carapace remarkably rugose (or spinose); chelipeds of the ordinary *Lambrus* form:—
  1. Carapace somewhat pentagonal, not vertically deflexed from the front of the gastric region: abdominal terga of the female with a series of large eroded pits down either side...... *P. horrida.*
  2. Carapace somewhat equilaterally triangular, vertically deflexed from the front of the gastric region: abdominal terga of the female with a series of convexities or nodules down the middle line, and on either side—
    i. Edges of carapace very strongly spinate: carpus of chelipeds and of ambulatory legs (like all the other parts of the body) strongly spinate: abdominal convexities of female spinate........................... *P. spinosissima.*

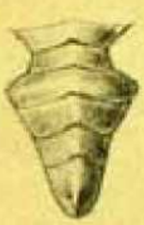
ii. Spinature very little developed: edges of carapace crenulate: carpus of chelipeds and of ambulatory legs granular or nodular: abdominal convexities of female not spinate .... *P. investigatoris*

II. The whole body and all the appendages beset with delicate paxilliform tubercles which unite to form a lace-work or frosting: chelipeds tapering, with long slender spiny fingers which are nearly as long as the palm .... *P.* (*Parthenomerus*) *efflorescens*.

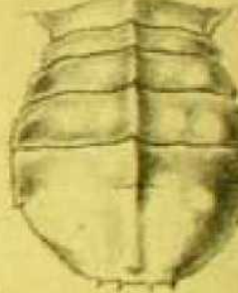
The present species, as well as *P. efflorescens*, have been figured for next year's issue (1896) of "Illustrations of the Zoology of the R.I.M.S. 'Investigator'."



2×2



2b×4



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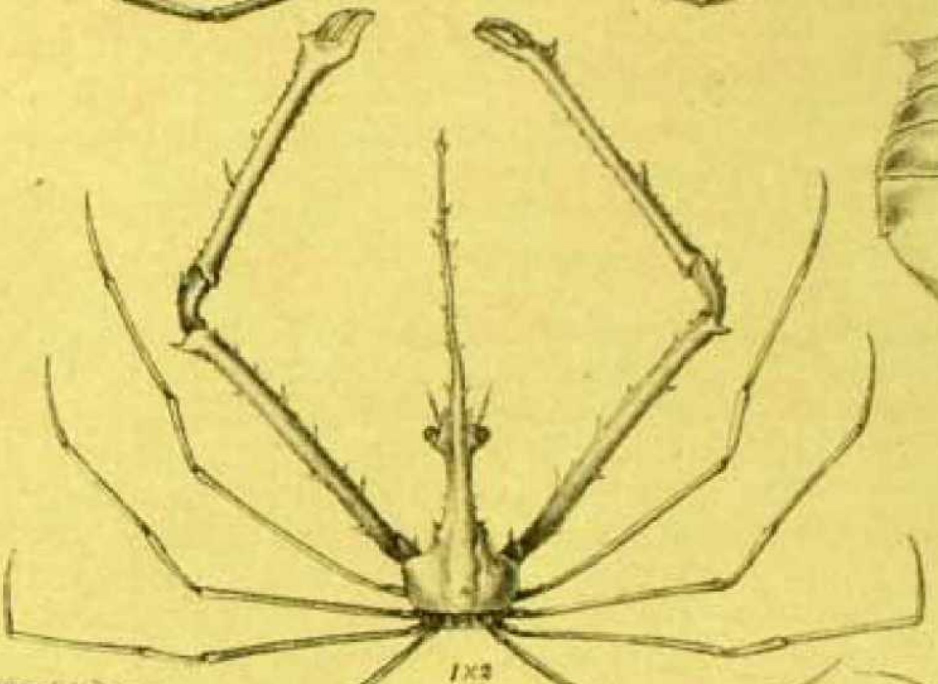
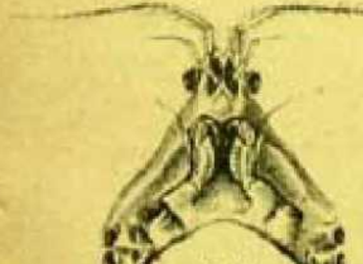
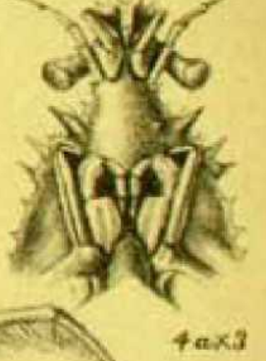


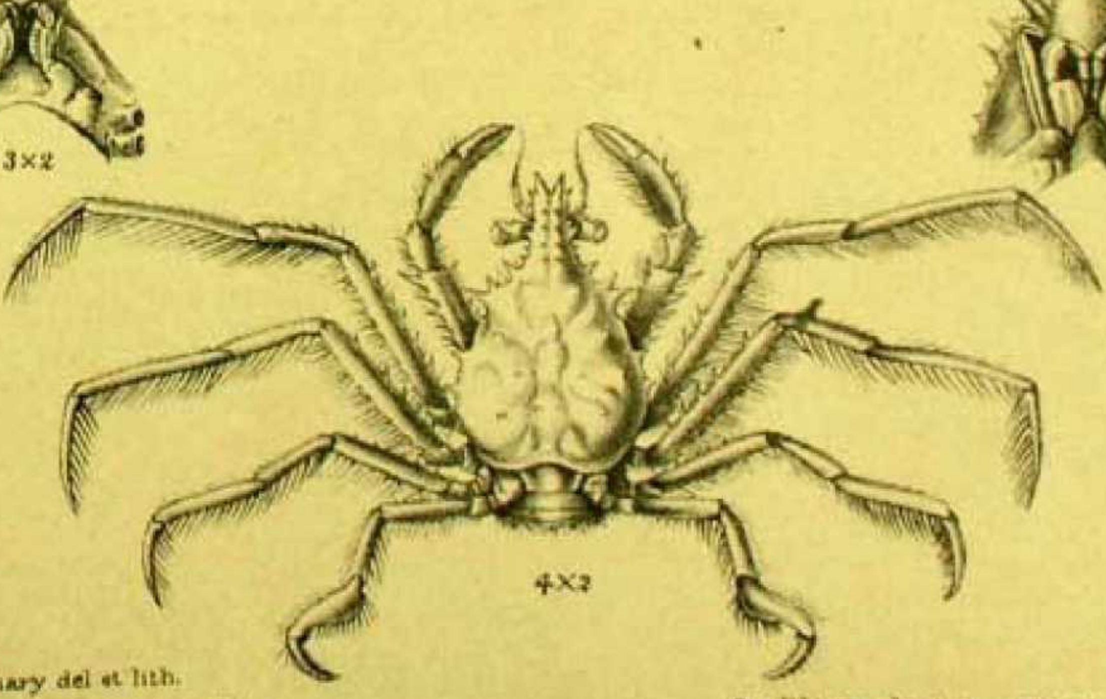
1×2



3×2



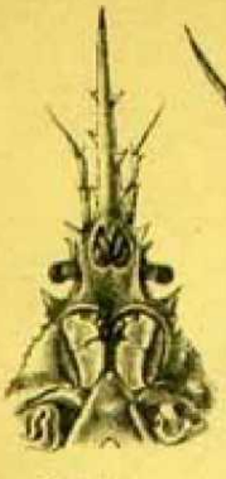
4a×3



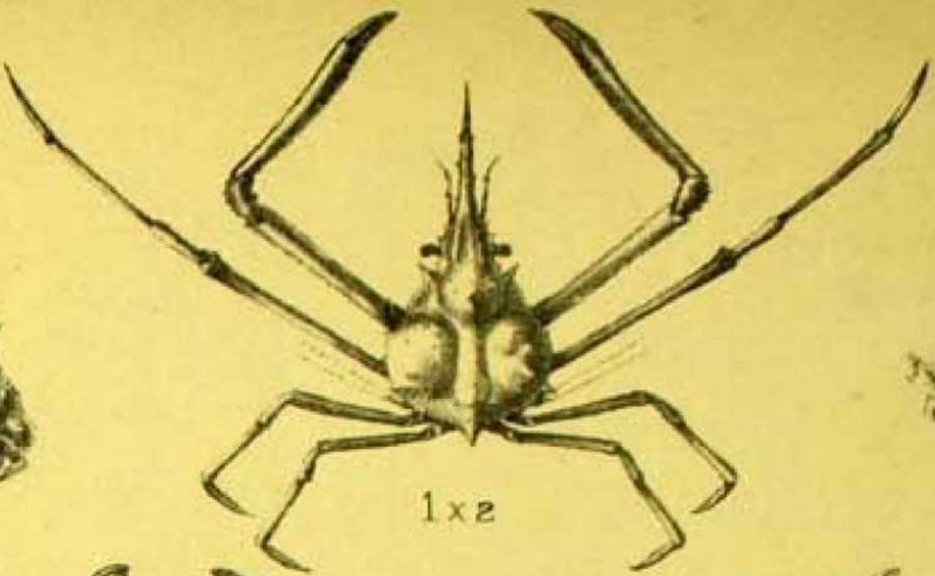
4×2

A.C. Chowdhary del et lith.

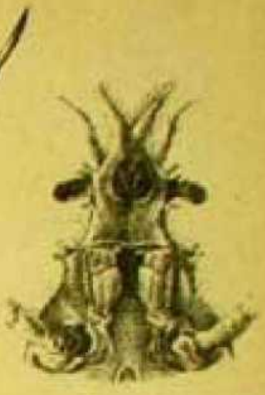
1. Lambrachæus ramifer.
2. Physachæus ctenurus.
3. Physachæus tonsor.
4. Grypachæus hyalinus.



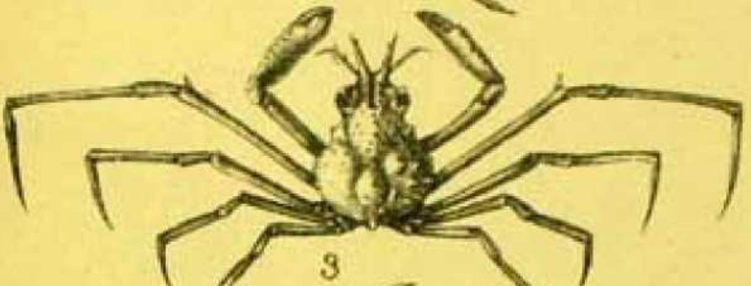
1a×3



1×2



2a×4



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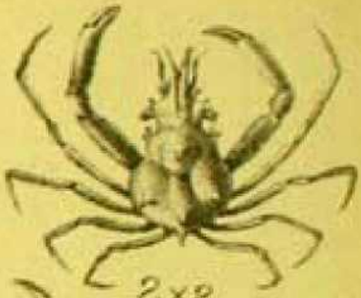
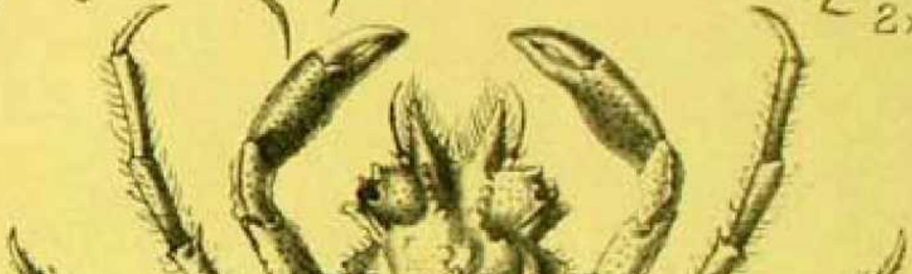


2×2



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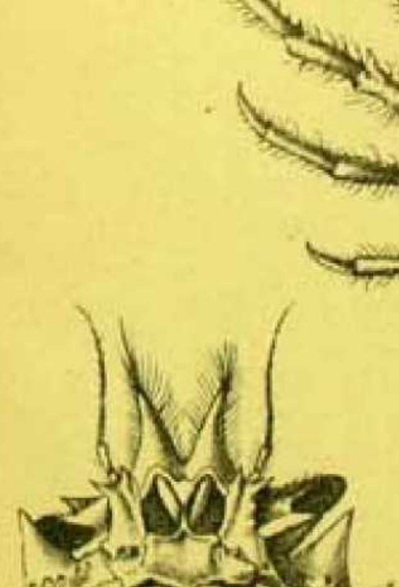
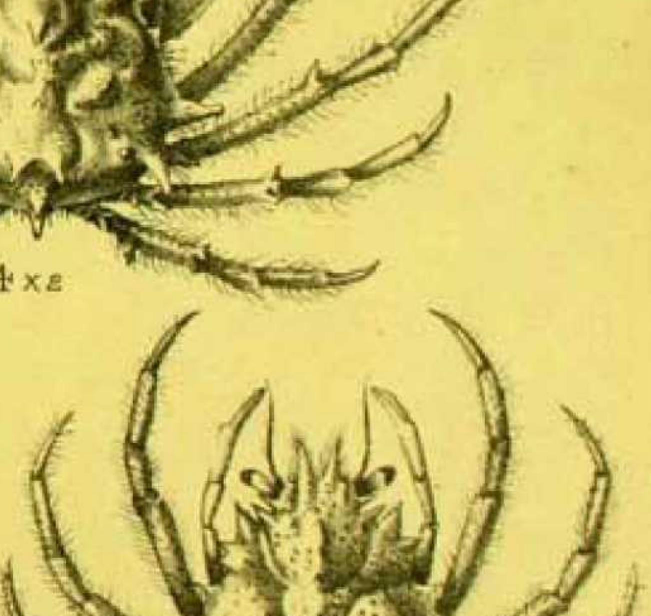


5a×2

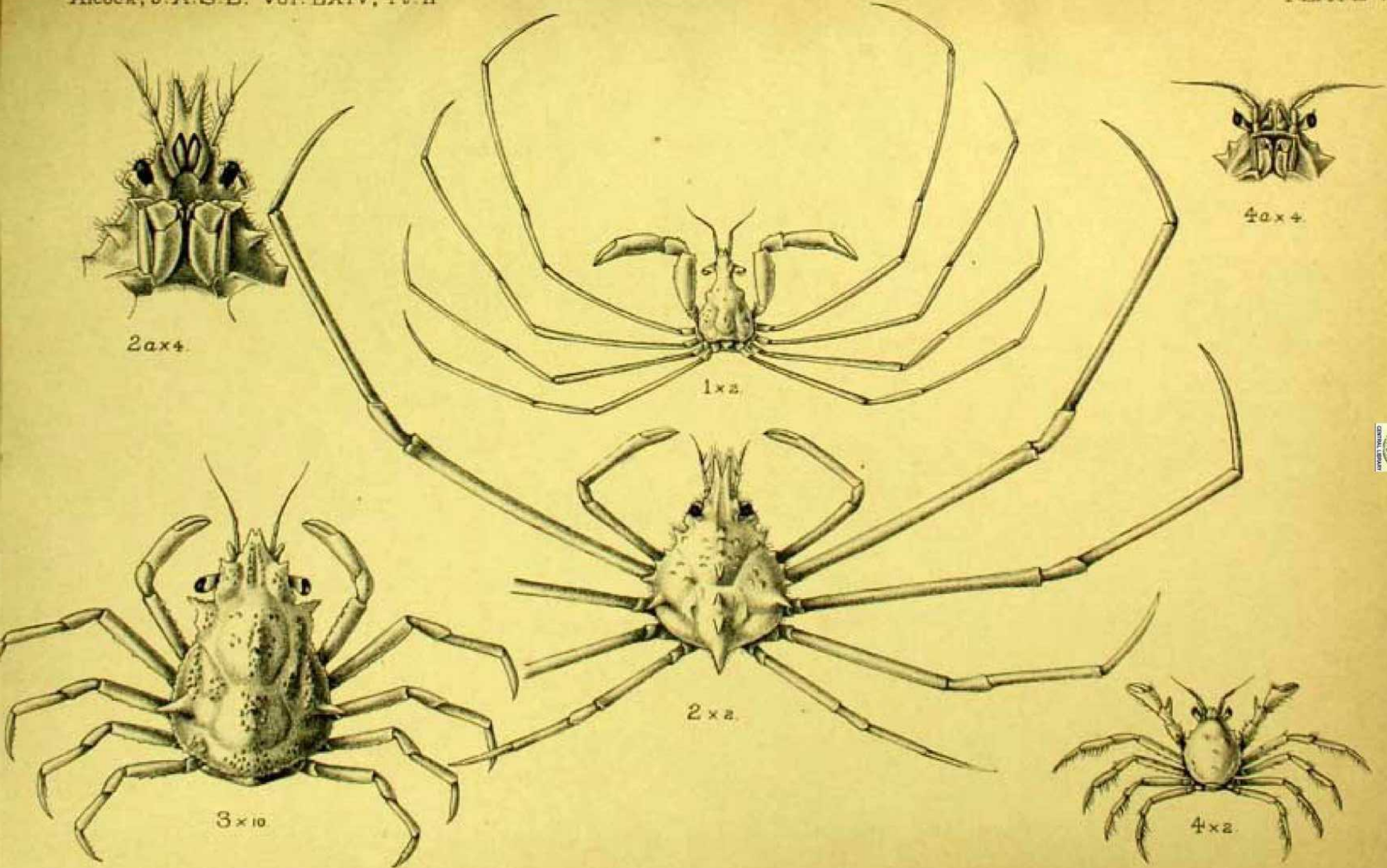


5

Chowdhary & S.C. Mondul del et lith.

1. Inachoides dolichorhynchus. 2. Apocremnus indicus.
3. Naxia investigatoris. 4. Macrocoeloma nummifer.
5. Maia gibba.

PLATE V.

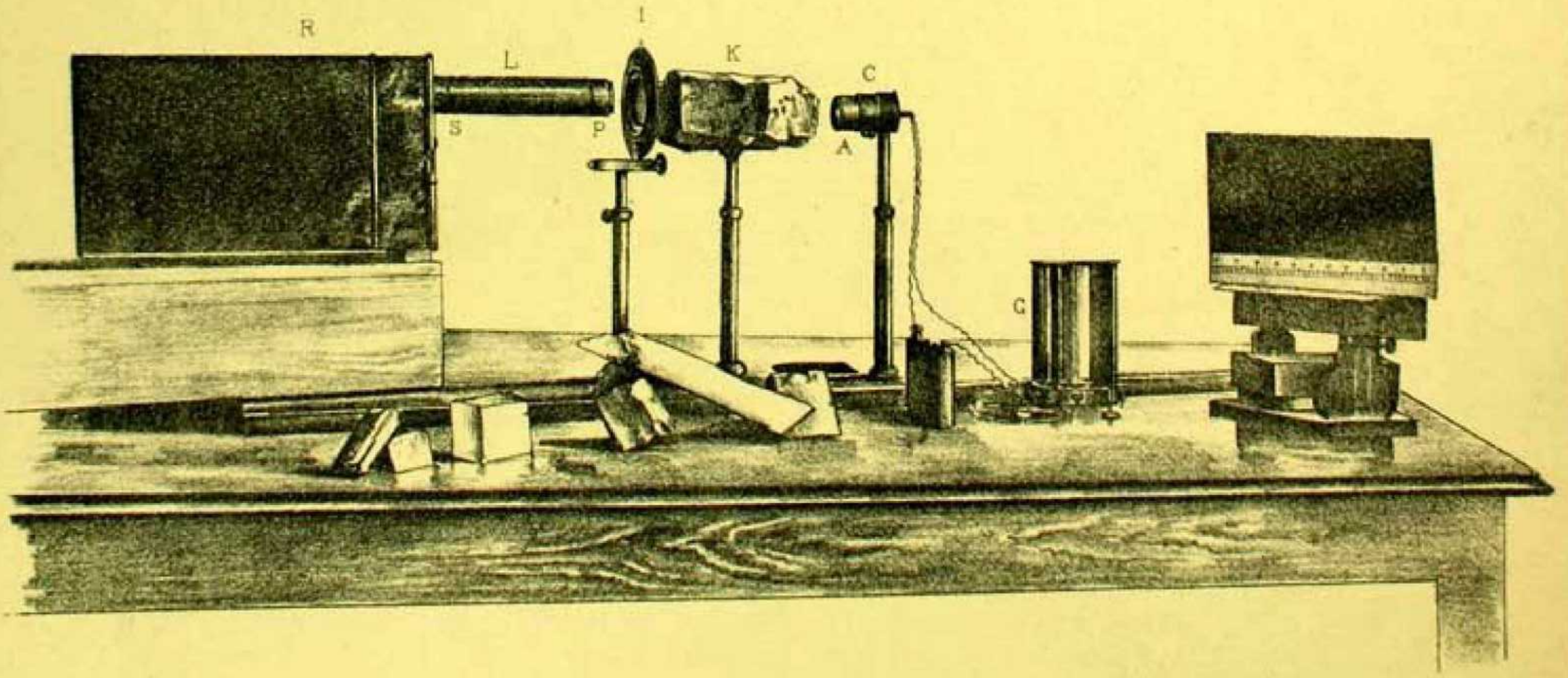


1. Achaeus cadelli. 2. Chorilibinia andamanica. 3. Collodes malabaricus 4. Paratymolus hastatus.

S C Mondul del A Chowdhary lith.

J.C. Bose, Jour. Asiat. Soc. Bengal Vol. LXIV. Pt. II

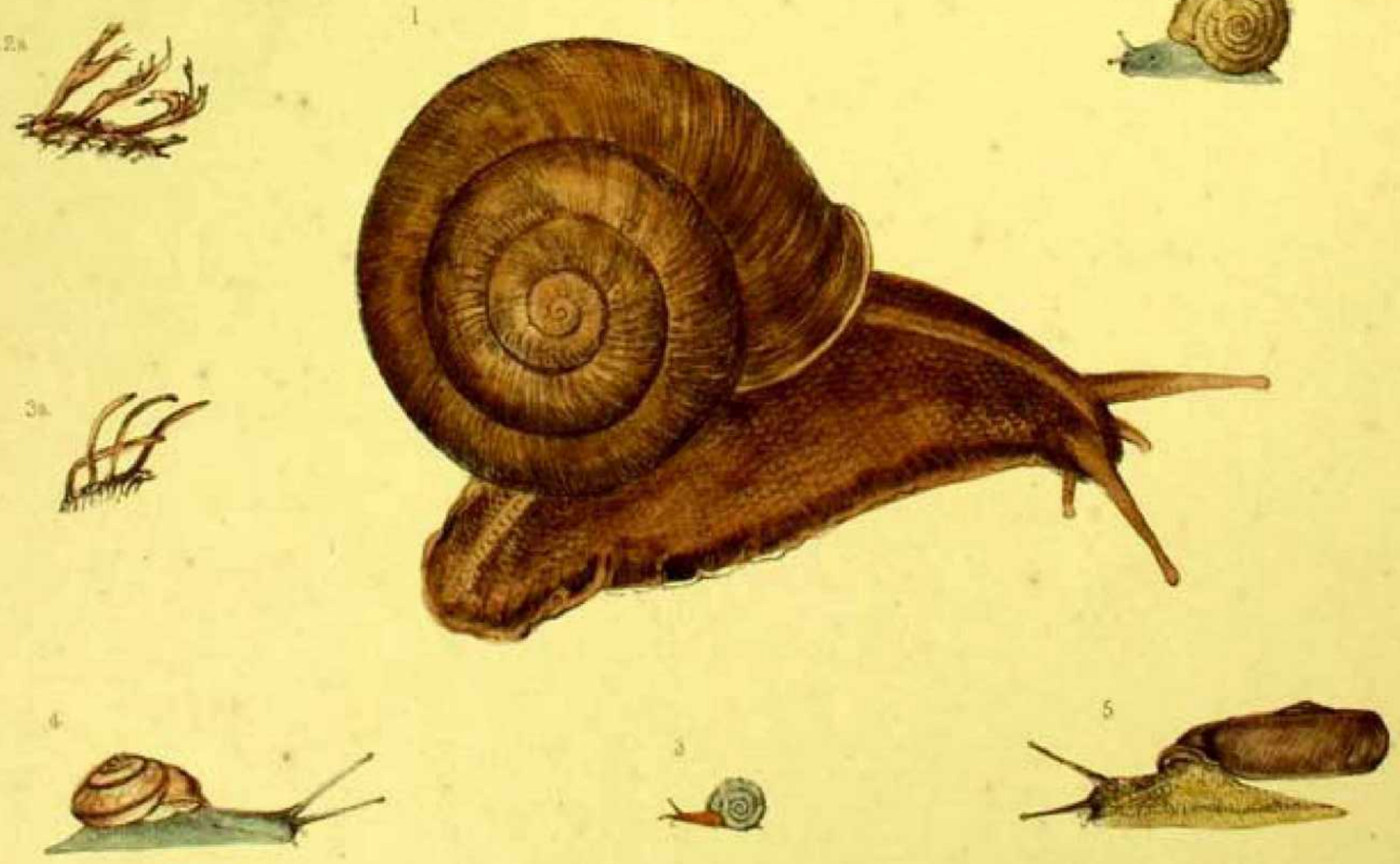
Plate VI.



A. Chowdhary Lith.

POLARISATION OF ELECTRIC RAY

Godwin-Austen, Jour. Asiat. Soc. Bengal Pt. II, 1895. Plate VI.



INDIAN LAND SHELLS.

H. H. Godwin-Austen, del. et lith.

Maclure & Macdonald Lith.

JOURNAL

OF THE

ASIATIC SOCIETY OF BENGAL.

Vol. LXIV. Part II.—NATURAL SCIENCE.

No. III.—1895.

A contribution to the History of Artificial Immunity.—*By* SURGEON-LIEUTENANT-COLONEL GEORGE RANKING, M.D.

[Read August, 7th.]

In these modern times when so much advance is being made in medicine, in the direction of the establishment of immunity against various toxic principles by the gradual habituation of the system to increasing doses of the virus, and then utilising the serum of the blood of animals in whom immunity has thus been established, for the "Vaccination" as it is conveniently termed of other non-protected animals, in many cases with complete success, it is not unworthy of us to enquire whether this is a newly discovered principle or whether it is merely a revival or development of a principle known to former ages.

The latest development of the principle of *antitoxine* immunity is the application of the method by which their presence in the serum is ensured, to snake poisoning.

Dr. Fraser of Edinburgh has found a means of so modifying the tissues of a non-protected animal, by gradually accustoming the organism to increasing doses of snake venom, that it not only exhibits certain resistance to even fifty times the minimum lethal dose, but also that the serum of the blood of these immune animals acquires the property of acting as an antidote to the snake poison in other animals. To procure this condition of the blood the usual method is to inject the venom subcutaneously, but Dr. Fraser has also succeeded in immunising cats by the administration of cobra venom by the stomach, and it is this special fact which has led me to the consideration of the methods in use centuries ago for this same purpose: that is to say, for the prevention or cure of poisoning by snake venom.

We know that centuries ago (about 450 B. C.,) Herodotus wrote about a people named the Psylli (ψύλλοι) living on the shores of the Greater Syrtis who were said to be masters of a secret art enabling them to secure themselves against the bites of venomous snakes. Another people, the Marsi of Central Italy, are said to have possessed the power of so charming venomous reptiles as to render them innocuous. This power, though chiefly exercised by their priests, is said to have been possessed in common by the whole nation. Thus Virgil (Æn. vii. 750) writes :—

> Quin et Marrubiâ venit de gente sacerdos
> Fronde super galeam et felici comtus olivâ
> Archippi regis missu, fortissimus Umbro:
> Vipereo generi, et graviter spirantibus hydris
> Spargere qui somnos, cantuque manuque solebat,
> Mulcebat que iras, *et morsus arte levabat.*

Even at the present day their descendants are to be found in and about Naples, who as itinerant snake charmers, claim to have inherited the same occult powers as their ancestors.

The Hawwás or Háwis of modern Egypt, also lay claim to these same powers, so that although it has rather been the custom to regard this class of people as charlatans and their claims as absurd, it is, in view of the recent results obtained by Dr. Fraser, of no little interest to examine a little more closely and try to obtain a clue to the methods pursued in various ages to procure immunity against snake poison.

As a slight contribution to this I propose to put forward a fact which has perhaps not received the attention it deserves, though it is well known. I allude to an ingredient of the celebrated تریاق or Snake-antidote of Persia.

The composition of this famous antidote is ascribed to Feridún, king of the Peshdádian dynasty of Persia. The Arab historians however assert that the best تریاق the تریاق فاروق "the selective antidote" was that of 'Iráq or Baghdád, and that the Khalífah Al Mutawakkil (232–247 A.H.) was in possession of a تریاق of such approved virtue that he was in the habit of causing people to be bitten by venomous serpents, so that he might display the properties of his antidote which cured the sufferers on the spot. The proverb in Persian:

تا تریاق از عراق آورده شود مارگزیده مرده بود

While the tiryáq is being fetched from 'Iráq the snake bitten victim becomes a corpse.

is of constant application to remedies applied too late.

There can be no doubt that this ترياق acquired a great reputation as a certain remedy for snake bite, and although its virtues may have been exaggerated, there is no reason for attributing to it the quality of uselessness, so that it really amounts to this, that the ancients were undoubtedly in possession of a means of counteracting the poison of venomous snakes.

Up to the present our position has been very different, in spite of all the labour which has been expended we have never as yet in modern times, at least, so far as the history of medical science goes, possessed a reliable remedy for snake bite. The effectual bite of a venomous snake has meant certain death. Our greatest authority, Sir Joseph Fayrer, states that after long and repeated observations in India and subsequently in England, he has been forced to the conclusion that all the remedies hitherto regarded as antidotes to snake poison are absolutely without specific effect upon the condition produced by the poison.

If then the ancients had so much the better of us, it is worth our while to find what clue to the solution of the problem we can gain from their practice.

The statements regarding the constitution of this famous ترياق are very few and very vague.

But I have happened in the course of reading to light upon a passage in an Old Arabic MS. in the library of the College of Fort William, which throws a most interesting light upon the subject, and tends to corroborate the results obtained by Dr. Fraser. The passage I refer to runs as follows:—I quote it in full though the part referring to the etymology of the word ترياق is common knowledge—

[The quotation is from a MS. (No. 194.) called بحرالجواهر (*Ocean of Pearls*) of date 937 H. (1530 A.D.) the author being Muḥammad ibn-Yúsuf, the physician, of Herát. The MS. bears date 1114 H. (1702 A.D.) according to the colophon it is the work of one Háfiẕ Muḥammad Husain ibn-Háfiẕ 'Alí who copied it for his own use. The place where he copied it is not stated.]

"The word ترياق" writes our author "is a Greek word derived from the word تريوق which is the name given to that which is venomous among animals, such for instance, as vipers and similar serpents. It is said that the ترياق (*tiryáq*) is only so called after the flesh of vipers has been cast into it, and then only because the viper is one of the venomous class of animals. One of the learned doctors states that the word ترياق is derived in the Greek language from the name given to biting animals (ذوات النهوش) and venomous animals (دوات السموم)

which in their language are called تريوق [1] and also from the name of the medicine for fatal poisons, because this medicine is of use for all those kinds of poison. Accordingly it was named ترياق. The Arabs corrected this and called it الترياق. (*The antidote κατ' ἐξοχήν.*) The Táj [2] states that it is only called ترياق because it contains the slaver (venom) of serpents (ريق الحيات). Al Jauharí says, "The word ترياق is an Arabicised Persian word meaning an antidote for poisons, the Arabs call wine ترياق because it dispels grief," and in the Talkhiṣ [3] it is called الترياق Al-taryáq (with fatha) and ترياق الفاروق Taryáq al Farúq *the selective (or discriminating) antidote;* also ترياق الافاعي Tiryáq al Afá'í and ترياق الاكبر Tiryáq ul Akbar, *the chief antidote.* This is that which restores the spirit of one who is suffering from the effects of poisonous drugs, to its normal condition. It takes four years in its preparation, and must not be used before that time has elapsed; it lasts from four to thirty years: the freshly prepared is efficacious in all cases, but in from thirty years to sixty years it becomes old and weak. The old ترياق resembles an old man, and the freshly prepared is like the youth.

The ترياق الاربع (*tiryáq ul arba'*) is compounded of four ingredients.

The ترياق الثمانيه (*tiryáq ul Ṣamániya*) is compounded of eight ingredients and is far more efficacious than the ترياق الاربع (*tiryáq ul arba'*).

The ترياق المجانين (*tiryáq ul mujánín*) is the name given to the flesh of hedgehogs, because it is good for sufferers from epilepsy and melancholia."

As to the other ingredients of this ترياق we have little or no information. Lane in his Lexicon states, that it contained "the best sort of Jew's pitch," *i.e.,* asphaltum, also called موميا *múmiá:* but the mere fact that the presence of either the flesh of vipers or their venom was indispensable shews that this was looked upon as the active ingredient, and it certainly appears that the administration of serpent venom as a means of establishing immunity against the bite of venomous snakes was known centuries ago.

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[1] (?) تريون θηριον

[2] تاج العروس date 709 H.

(H. K.)

[3] Talkhíṣ fil Lughat, by Abu Hilál Hasan ibn-Abdullah Askerí, died 395 H.

(H. K)

Noviciæ Indicæ IX. *Some additional* Papaveraceæ.—*By* D. Prain.

[Read August, 7th.]

The account of this natural order in the *Flora of British India* (i. 116–119) was published 23 years ago (May 1872). Since that date a number of forms new to the Indian area have been communicated to the Calcutta Herbarium from the various frontiers of the Empire. Some of these require to be added to the Indian Flora, not because they were unknown when the first volume of the *Flora of British India* was published—a few of them as a matter of fact are included in the *Flora Indica* published by Drs. Hooker and Thomson in 1855, which included in its purview the area beyond the north-west frontier comprising Beluchistan and Afghanistan that is excluded from the scope of the later work—but owing to extension of Indian territory towards the north-west during the past quarter of a century. In the present paper it is proposed to provide diagnoses of those forms in as nearly as may be the style of the diagnoses in the *Flora of British India*; to obviate the possibility of confusion between the forms now described and those given in the *Flora*, keys have been prepared showing the relationships of *all* the Indian species in each genus.

To assure himself of the probable validity of the species here proposed as new, and of the accuracy of the nomenclature of those previously described, the writer has compared examples of each with the material of the order contained in a number of European collections. He has also had the advantage of the use of the material in Herb. Saharanpur kindly placed at his disposal by Mr. Duthie, that in Herb. Zürich kindly lent by his friend Prof. Schinz and that in the private collection of Mr. C. B. Clarke kindly lent by its owner. For facilities in consulting the public Herbaria at Kew, the British Museum, Paris and Geneva, the writer has to thank Mr. Dyer, Mr. Carruthers, M. Ed. Bureau, and Dr. J. Mueller respectively; while for permission to study the material in their magnificent private collections, he is deeply indebted to M. Casimir de Candolle and M. Barbey-Boissier of Geneva, and to M. Drake del Castillo of Paris. And for assistance and advice most ungrudgingly given during his study of these Indian species, the writer would wish to thank many friends, but more especially M. Casimir de Candolle, Geneva; M. Ad. Franchet, Paris; Dr. Batalin, St. Petersburg; and Surgn.-Captn. Cummins, Army Medical Staff.

The limitation of genera, at all times a subject of discussion, is particularly perplexing among Thalamifloral orders; the difficulties that beset the student of *Papaveraceæ* in particular are many and great. A complete review of these difficulties could only be appropriate in a revision of the order as a whole. Still even in a partial and more or less cursory review like the present, it is impossible to avoid an allusion to some of them; a brief note is therefore added to the systematic account of each genus.

PAPAVERACEÆ.

Key to the Indian genera (including those newly reported).

* Capsulses opening by short valves or pores :—
  † Stigmas radiating on a sessile disc; (sepals 2, petals 4) 1. PAPAVER.
  † † Stigmas at the top of a distinct style :—
    ‡ Stigmas discrete above, patent; sepals 3, petals 6,... 2. ARGEMONE.
    ‡ ‡ Stigmas concrete throughout, decurrent; sepals 2, petals 4 in 2 pairs, or 5–9 in an imbricate spiral 3. MECONOPSIS.
* * Capsules dehiscing throughout their length; (sepals 2, petals 4) :—
  † Stigmas sessile :—
    ‡ Stigmas radiating; valves 3-4, rarely 2; fruit without dissepiment ... ... 4. ROEMERIA.
    ‡ ‡ Stigmas prolonged as 2 horizontal arms; fruit with a pseudo-replum in which the seeds are partially embedded ... ... 5. GLAUCIUM.
  † † Stigmas at the top of a distinct style :—
    ‡ Stigmas concrete throughout, valves 3–6 ... 6. CATHCARTIA.
    ‡ ‡ Stigmas discrete above, valves 2 ... ... 7. CHELIDONIUM.

1. (1.) PAPAVER LINN.

Key to the Indian species (incorporating the new forms).

* Perennial; scapes simple leafless; flowers orange-yellow; (filaments subulate; capsule hispid; whole plant hirsute) ... ... 1. *P. nudicaule.*
* * Annuals; stems branching leafy; flowers scarlet, purple or pink :—
  † Stem-leaves not amplexicaul; plants usually hispid :—
    ‡ Capsules hispid; leaves 2-3-pinnatifid; (flowers scarlet with dark purple eye) :—
      § Sepals obtuse: filaments dilated upwards ... 2. *P. hybridum.*
      § § Sepals with horn-like subapical processes; filaments filiform ... ... 3. *P. pavoninum.*
    ‡ ‡ Capsules glabrous; leaves 1-2-pinnatifid; (filaments filiform) :—
      § Capsules subglobose stalked; lobes of disc overlapping ... ... 4. *P. Rhœas.*
      § § Capsules oblong sessile; lobes of disc distinct :—
        ¶ Lobes of disc plane and separated by shallow sinuses ... ... 5. *P. dubium.*
        ¶ ¶ Lobes of disc strongly ridged and separated by deep divisions (disc stellate) ... 6. *P. turbinatum.*

† † Stem leaves clasping; plants glabrous and glaucous; (capsules glabrous):—
  ‡ Capsules obovate-oblong, sessile; filaments subulate; small plants 6–12 in. high ... ... 7. *P. Decaisnei.*
  ‡ ‡ Capsules globose, stalked; filaments dilated upwards; tall plants 2–4 feet high ... ... 8. *P. somniferum.*

The genus *Papaver* is hardly an Indian one; *P. somniferum* is only known as a cultivated plant while, except in a cultivated form, *P. Rhœas* is hardly known in India. *P. hybridum* is a species widespread in the Mediterranean and Oriental regions; *P. pavoninum*, *P. turbinatum*, *P. Decaisnei* are three species common in the Orient (Asia Minor, Syria, Persia, Afghanistan and Beluchistan): all four species are therefore Indian only because, along its extreme north-west border, the Indian Empire includes a fringe of their natural geographical area. Of the remaining two the Alpine species, *P. nudicaule*, occurs only in the Hindu-Kush and Karakoram and is thus not even truly Himalayan, while the temperate species *P. dubium* is a mere corn-field weed. Even that is limited to the North-West Himalaya, where it occurs in a form which extends from Southern Russia through all the intermediate countries to the area indicated.

1. (1.) Papaver nudicaule *Linn. Sp. Pl.* ed. i., i. 507 (1753).

Var. rubro-aurantiacum *Fisch.* ex *DC. Syst. Veg.* ii. 70 (1821); *Sims, Bot. Mag.* t. 2344 (1822); *DC. Prodr.* i., 118 (1824). P. croceum *Ledeb., Flor. Altaic.* ii. 271 (1830). P. alpinum var. croceum *Fisch. & Mey. Ind. Sem.* iii, 44 (1837); *Ledeb., Flor. Ross.* i., 87 (1842). P. nudicaule var. croceum *Elkan, Monogr. Papav.* 17 (1839); *Walp. Rep.* i. 111 (1842). P. nudicaule *H. f. & T., Flor. Ind.* 249 (1855) *Boiss. Flor. Orient.* i. 107 (1867); *H. f. & T. Flor. Brit. Ind.* i. 117 (1872).

All the Indian wild specimens are referable to this particular variety which has orange-yellow flowers, dark coloured hairs on the scapes and dark-coloured setæ on the capsules. The geographical area of this variety extends from Afghanistan, Northern Kashmir and Western Tibet, through Soongaria and along the Altai range to Mongolia and Northern China.

A remarkably fine cultivated form of this plant is to be found in gardens in South-Eastern Tibet and in the Chumbi valley. The flowers are sometimes over 3 inches in diam. and though occasionally yellow, are usually dark purple and look very much like those of *P. Rhœas*. Some of the Tibet specimens are partially double-flowered: these were collected in the province of Tsang and communicated to Calcutta by the Lama Ujyen Gyatsko. The Chumbi specimens were obtained by one of Dr. King's Lepcha collectors. It is somewhat remarkable that we have never yet succeeded in obtaining seeds of this plant which might be known as P. *nudicaule* var. *grandiflora.* Apparently it does not occur in gardens in Sikkim.

2. (2.) Papaver hybridum *Linn.*

3. (—.) Papaver pavoninum *Schrenk* ex *Fisch. & Mey.* in *Enum. Pl. nov. Schrenk* 64 (1842); leaves pinnatipartite, segments oblong-

linear incised-dentate sparingly hispid, filaments filiform, sepals hirsute *with a dorsal conical process under the tip;* capsule ovate setose aculeate, stigma convex rays 4–6. *C. A. Mey.* in *Ind. Sem.* ix. 35, 82 (1843); *Bunge, Rel. Bot. Lehm.* 16 (1847); *Stscheg. Bull Soc. Mosc.* (1854) i., 151; *Trautv. Bull. Soc. Mosc.* (1860) i. 91; *Regel & Herder, Bull. Soc. Mosc.* (1866) iii. 90; *Boiss. Flor. Orient.* i. 116 (1867); *Osten-Sacken & Rupr. Sert. Tianschan.* 38 (1869); *Regel & Herder, Bull. Soc. Mosc.* (1870) ii. 248. P. hybridum *Kar. & Kir. Bull. Soc. Mosc.* (1842) i. 141 *non Linn.* P. cornigerum *Stocks, Lond. Journ. Bot.* iv. 142 (1852): *H. f. & T. Flor. Ind.* 250 (1855); *Walp. Ann.* iv. 173 (1857).

PANJAB: Peshawar, *Vicary! Stewart!* SCINDE: *Stocks!* BRITISH BELUCHISTAN: near Quetta, *Sanders! Duke! Lace! Duthie! Appleton!* DISTRIB. Throughout Beluchistan, Afghanistan, Turkestan and Soongaria.

Annual, stems slender sparingly branched; leaves, flowers and habit very like those of *P. hybridum*; the capsules however are smaller while the horned sepals and the filiform filaments at once easily distinguish it.

4. (3.) PAPAVER RHŒAS *Linn. Sp. Pl.* ed. i., i. 507 (1753).

VAR. *typica*; stigmatic rays 8–12.

This is an extremely rare plant in India; the only undoubted specimens the writer has seen were collected by Sir D. Brandis in Chamba, Panjab Himalaya (*Brandis* n. 4336!). Some specimens that may also be referable to genuine *P. Rhœas* were collected in Kashmir by Dr. T. Thomson. These, however, in spite of the smaller number of their stigmatic rays, look more like a reversion to type, after "escape," of the following variety, than like the European plant.

VAR. *latifolia*; stigmatic rays 12–20. Papaver Rhœas VAR. latifolia *Ham. Mss.* in *Wall. Cat.* n. 8119 (1830). P. Hookeri *Baker* in *Bot. Mag.* cix. t. 6729 (1883). The SHIRLEY POPPY: *Journ. of Horticult.* (1886) p. 367, f. 55.

Cultivated in Indian gardens from SCINDE, *Stocks!* to the NORTH-WEST PROVINCES, *Royle! Falconer! Thomson! King!* and LOWER BENGAL, *Hamilton! Hooker!*

Annual, branched, 3–4 ft. high, covered with spreading hispid hairs; *stem* as thick as little finger at base, branches erect and ascending, flowering copiously; *flowers* 2–4 in. across; petals in unequal pairs, crenulate, pale rose to bright crimson, base wedge-shaped with diffused white to blue-black spot; *capsule* $\frac{1}{2}$–$\frac{3}{4}$ in. diam., shortly stalked, crenations of disk rounded overlapping.

From this description, which applies to the cultivated plant, it will be seen that there is hardly room for doubt that we have here to deal with only a form of *P. Rhœas*. The distinguishing *botanical* feature is the larger number of stigmatic rays; on the strength of this character Mr. Baker has proposed specific rank for the plant. This it certainly does not deserve and from the existence of a very intermediate state in Kashmir it is doubtful if its separation even as a variety is altogether valid. It is however very easy, even in the Herbarium, to distinguish this plant from cultivated forms of *P. Rhœas* proper introduced from Europe which grow with a luxuriance that equals that of VAR. *latifolia* itself. The form seems to have originated in Indian gardens and is supposed to have only recently been introduced to European culture. This is however not quite exact, for the Poppy now known as the Shirley Poppy, which seems to be undoubtedly the Indian *P. Rhœas* VAR. *latifolia*, has been in continuous cultivation in Scotland for over half a century.

Occasional references in Indian writings to the presence of *P. Rhœas* must be discounted In the majority of cases *P. dubium*, not infrequently *P. turbinatum*, is the species intended; the idea having become prevalent that the plant which is really *P. Decaisnei* is *P. dubium*, not unnaturally the casual observer supposes that what is really *P. dubium* must be *P. Rhœas*.*

5. (4.) PAPAVER DUBIUM *Linn. Sp. Pl.* ed. i., ii. 1196 (1753.).

VAR. glabrum *Koch, Syn.* 30 (1837). P. dubium VAR. lævigatum *Elkan, Monogr. Papav.* 25 (1839); *H. f. & T. Flor. Ind.* 250 (1855); *Walp. Ann.* iv. 176 (1857). P. lævigatum *M. Bieb. Flor. Taur. Cauc.* iii. *Suppl.* 364 (1819); *DC. Syst. Veg.* ii. 78 (1821); *Prodr.* i. 119 (1824); *Spreng. Syst.* ii. 569 (1825); *Reichb. Pl. Crit.* iv. 41. t. 533 (1826); *C. A. Mey. Verzeichn. Pfl. Cauc.* 175 (1831); *Boiss. Flor. Orient.* i. 114 (1867). P. glabellum *Stev.* ex *DC. Syst. Veg.* ii. 78 (1821). P. glabrum *Royle. Ill.* 67 (1839).

All the Indian specimens of *P. dubium* are referable to this variety which is distinguishable from the type only by being subglabrous with the few setæ on the scape, the lower surface of the leaves and the sepals, adpressed. In South-Eastern Europe intermediate forms connecting this with true *P. dubium* are plentiful; no such connecting forms and no examples of true *P. dubium* occur in India. The geographical area of this variety extends from Southern Russia, the Caucasus and Georgia through Eastern Asia Minor, Armenia and Persia to Northern Beluchistan, Afganistan and the North-West Himalaya as far eastward as Garhwal. The figure by Reichenbach quoted above (*Pl. Crit.* 533) is made from Bieberstein's original examples collected near Odessa; that figured under the same name by the same author in *Flor. German.* t 4478 b. is not this plant.

6. (—.) PAPAVER TURBINATUM *DC. Syst. Veg.* ii. 84 (1821); leaves 1–2-pinnatisect, filaments filiform, capsule elliptic-oblong glabrous, stigma 6–10-rayed crenations of disc deeply cut, widely separated and ridged. *DC. Prodr.* i. 120 (1824); *Boiss. Flor. Orient.* i. 144 (1867). P. macrostomum *Boiss. & Huet.* in *Sched. Pl. Huet.* (1855); *Boiss.*,

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* In a circular regarding sheets missing from the Wallichian type Herbarium which is preserved in the rooms of the Linnean Society of London n. 8119 is noted as being there unrepresented. This is a mistake; the specimen is present and in good condition; it has been overlooked owing to its having been inadvertently glued down along with n. 8120.

Flor. Orient. i. 115 (1867). P. Rhœas *Wall. Cat.* n. 8120 (1830) *nec Linn.* P. Rhœas? *H. f. & T. Flor. Ind.* 251 (1855).

KASHMIR: common, *Falconer! Thomson! Aitchison!* at Romoo, 6000 feet, *Clarke* n. 28543! at Srinagar, 5300 feet, *G. Gammie!* cultivated or an escape. BENGAL: cultivated, *Hamilton!* DISTRIB. Yarkand, Afghanistan, Persia and Armenia.

Annual, branched, 1–2 ft., scapes with adpressed hairs; leaves, habit and general appearance of *P. dubium* VAR. *glabrum* (*P. lævigatum* M. Bieb.) and of *P. Rhœas* VAR. *commutatum* (*P. commutatum* Fisch. and Mey.) but easily distinguished from all forms of *P. Rhœas* by the shape of its capsule which is like that of *P. dubium*, and from all forms of *P. dubium* by its deeply lobed, star-like disc with ridged crenatures. *Petals* purple with a dark basal eye; *capsule* ¾ in.–1 in. long.

The presence of this species in India has been overlooked owing to its having been mistaken when in flower for *P. Rhœas* and when in fruit for *P. dubium.* Of its specific position there is not however any doubt: the Indian plant is exactly that which forms the type of *P. macrostomum* Boiss. and Huet. Since the publication of the *Flora Orientalis* however very large suites of specimens of *P. macrostomum* have been reported. These show that, like its allies *P. dubium* and *P. Rhœas*, this is an extremely variable plant and a careful study of all the specimens in M. Boissier's own Herbarium, in Herb. Kew and in Herb. Paris has convinced the writer that *P. macrostomum* is not specifically distinct from *P. turbinatum*, the solitary specimen of which has the same capsule and disc and only differs in foliage and in stature from the original specimens of *P. macrostomum.* Since the latter species was proposed all the necessary intermediates have been reported again and again.

8. (—.) PAPAVER DECAISNEI *Hochst. & Steud.* in *Schimp. Pl. Arab. exs.* n. 125 (April 1836); leaves pinnatipartite, segments lanceolate-dentate, cauline rounded at base and amplexicaul; capsule ovate-oblong glabrous, stigma 5–7-rayed. *Boiss. Flor. Orient.* i. 115 (1867). P. turbinatum *Fresen. Mus. Senkenb.* 173 (1834) *non DC.* Papaver sp. nov. *Decaisne, Fl. Sinai.* 45 (1835). P. dubium VAR. Decaisnei *Elkan, Monogr. Papav.* 26 (1839). P. dubium VAR. lævigatum *H. f. & T. Flor. Ind.* 250 (1855) *in part*; *Aitchison. Journ. Linn. Soc.* xviii. 32 (1881) *in part. non Elkan.*

PANJAB: Rawal Pindi, *Aitchison* n. 44! Trans.-Indus dist., *Stewart!* SCINDE: *Stocks!* DISTRIB. Beluchistan, Afghanistan, Persia, Arabia, S. Syria.

A glaucescent glabrous annual or rarely a biennial 6–12 in. high, with very short stems and long peduncles; *flowers* 1 in. diam., sepals glabrous, petals obovate rose purple with dark eye; anthers shortly oblong.

The Eastern limit of the geographical area of this species lies just inside the frontier of the Indian Empire along its whole north-west border. The species has been associated by Elkan and by most Indian botanists with *P. dubium* VAR. *laevigatum*, and the resemblance is indeed often very great. It is however easily distinguished by its perfectly glabrous glaucous appearance and by its stem-leaves which clasp at the base. Some specimens collected by Dr. Stapf in Persia show that occasionally the species may be distinctly biennial.

9. (5.) PAPAVER SOMNIFERUM Linn.

It is of interest, in connection with the theory that the people of China first learned the use of Opium and first obtained the Opium Poppy itself from India, to find from a careful examination of specimens of the Poppy cultivated for Opium in China that are preserved in the magnificent botanical collections of London, Paris and Geneva, that this Poppy belongs to a race quite distinct from the Indian plant, more nearly allied to the form of *Papaver somniferum* that produces Persian Opium than to the form that is cultivated in Hindustan. The specimens referred to come from Yunnan, Szechuen, Hunan and Hupeh. Curiously the only Chinese specimens of *Papaver somniferum*, cultivated for Opium, that are indistinguishable from the Indian race, which the writer has seen, are in Herb. Calcutta. They were communicated by Fortune in 1853 and are from the Eastern province of Che-kiang, not from Central or South-Western China where the Opium Poppy is chiefly cultivated.

2. (1*.) ARGEMONE Linn.

1. Argemone mexicana *Linn.*

Four of the gatherings issued by Wallich under this name (*Cat. Lith.* n. 8126) are really this species, the fifth (8126 E. from Kamaon) is the yellow-flowered *Meconopsis* described by Hooker and Thomson as *M. robusta*.

3. (2.) MECONOPSIS Viguier.

Key to the Indian species (incorporating the new forms.)

* Stems, leaves, sepals and ovaries prickly; stigmas pyramidal (flowers pale purple, papaveroid, (*i.e.*, petals 4) exceptionally sanguinarioid, (*i.e.*, 5–8) :—

  † Stems not leafy, radical leaves many persisting; scapes radical 1-fld. or pseudo-cymose from agglutination of scapes, pedicels not or very rarely bracteate, torus distinctly enlarged; leaves lanceolate (entire or, rarely, acutely dentate; capsules densely aculeate short oblong or obovate, twice as long as style)... ... 1. *M. horridula.*

  † † Stems leafy, radical leaves few vanishing; flowers in racemose cymes with bracteate pedicels; torus not expanded; leaves oblong :—

    ‡ Leaves irregularly pinnatifid; capsules densely aculeate, short oblong or obovate, twice as long as style ... ... 2. *M. aculeata.*

    ‡ ‡ Leaves with sinuate or subentire margins; capsules sparsely aculeate long narrowly obconic, five times as long as style ... ... 3. *M. sinuata.*

* * Stems, leaves, sepals and ovaries without prickles; stigmas capitate entire or (in *M. primulina*) 2-lobed :—

  † Stems leafy :—

    ‡ Stems often branching, cymes many-flowered rare-

ly simple; flowers papaveroid, (*i.e.*, petals 4); (tall tomentose or hirsute plants, radical leaves few, cauline many all scattered; capsules setose):—

§ Capsules ovate 8–11-valved, style short much thickened at base:—

¶ Flowers yellow:—

× × Stems and leaves sparsely crinite at length glabrescent; cauline leaves pinnatifid, lobes rounded acute; sepals sparsely crinite capsule with few adpressed setae 4. *M. robusta.*

× × × × Stems, leaves and sepals hispidly hairy and densely softly tomentose; cauline leaves coarsely dentate; capsule densely covered with ascending setae and close stellate pubescence ... ... 5. *M. paniculata.*

¶ ¶ Flowers white (stems, leaves and sepals hispidly hairy and densely softly tomentose; cauline leaves finely toothed) ... 6. *M. superba.*

§ § Capsules shortly cylindric 5–7-valved, style long slender throughout:—

¶ Flowers dark fuscous-purple; stems, leaves and sepals sparsely hirsute with long hairs ... ... 7. *M. napaulensis.*

¶ ¶ Flowers pale blue-purple; stems, leaves and sepals softly densely puberulous ... 8. *M. Wallichii.*

‡ ‡ Stems always simple, cymes few-fld. simple; flowers sanguinarioid, (*i.e.*, petals 5–9); (purple):—

§ Radical leaves few vanishing; cauline close-set on a short stem (pseudo-radical) scapes long: small glabrous or sparsely setose plants with narrowly ovoid glabrous capsules *and 2-lobed stigmas* ... ... 9. *M. primulina.*

§ § Radical leaves many persisting, cauline few the lower scattered the upper whorled; pedicels short; tall softly hairy plants with linear-oblong sparsely hispid capsules ... ... 10. *M. grandis.*

† † Stems not leafy scapes numerous radical, (flowers purple, radical leaves many persisting):—

‡ Leaves simple dentate, scapes long, capsules linear-oblong sparsely hispid; large softly hairy plants with sanguinarioid flowers, (*i.e.*, petals 5–8) ... 11. *M. simplicifolia.*

‡ ‡ Leaves 2-3-pinnate; scapes short, capsules shortly obovate glabrous; dwarf perfectly glabrous plants with sub-papaveroid flowers, (*i.e.*, petals 4 or 5)... 12. *M. bella.*

Species 1–3 constitute the group *Aculeatæ* extending throughout the Himalayas and Tibet and occurring in Szechuen and Yunnan; species 4–8, the group *Robustæ* peculiar so far as is known to the central and Eastern Himalaya; species 9 belongs to the group *Primulinæ* of which the remaining known members inhabit Szechuen and Yunnan; species 10 and 11 to the *Grandes* of which the three other known members occur in Kansu, North Tibet, Szechuen and Yunnan; species 11 is the only representative of a very distinct group the *Bellæ*.

The genus includes 2 other groups not represented in India; *viz.*, the *Chelidonifoliæ* with 2 Chinese and 1 Western European species and the *Anomalæ* with 2 Californian species.

Unlike *Papaver*, *Meconopsis* is a characteristically Himalayan genus since 12 species, or nearly one-half of the known forms have been reported from the Himalayan region. Only two occur in the Western Himalaya; one, *M. aculeata*, extending from Garhwal and Kunawar to Kashmir, overlaps the eastern fringe of the area occupied by *Papaver*; the other, *M. robusta*, which is perhaps only a condition, and certainly is at most the representative, of the more widely distributed *M. paniculata*, is confined to Kamaon. It is only when we reach the region from Central Nepal eastward that we come upon the main body of the genus. In Central Nepal we find three species, *M. paniculata*. *M. napaulensis* and *M. simplicifolia*; these we find in Eastern Nepal and Western Sikkim along with five other forms; *M. Wallichii*, which seems only a local manifestation of *M. napaulensis*; *M. sinuata*, a similar local manifestation of *M. aculeata*; *M. grandis*, a local manifestation of *M. simplicifolia*; *M. horridula*, a somewhat variable species widely extended throughout Tibet and Western China of which *M. aculeata* and *M. sinuata* alike appear to be derivates; lastly, the exceedingly distinct *M. bella*. Somewhat further east we come upon *M. superba*, a very handsome species that would however appear to be hardly more than a local representative of *M. paniculata*; and *M. primulina*, a near ally, and perhaps only the local representative of a Szechuen species, *M. Henrici*.

The region which includes Western and Central China from Kansu to Yunnan and Hupeh is quite as rich in species as the *explored* Eastern Himalaya. In Kansu there are three species; *M. quintuplinervia* and *M. punicea* extending to Northern Tibet, and *M. integrifolia* extending to Szechuen and Yunnan; all three are near allies of the Sikkim *M. simplicifolia*. In Szechuen we find six; one species, confined to the province, is *M. Henrici* nearly allied to the Himalayan *M. primulina*; another is a form of the Tibeto-Himalayan *M. horridula*; a third is apparently a form of the Sikkim *M. sinuata*; a fourth is *M. integrifolia* already discussed; the last two are species which are very distinct from the rest and which have no Himalayan representative, but which are very closely allied to each other; these are *M. chelidonifolia*, confined to Szechuen, and *M. Oliveriana* extending also to Hupeh. In Yunnan, besides *M. integrifolia* and a form of the nearly ubiquitous *M. horridula* there are two species of the *Primulinæ* group, *M. lancifolia* and *M. Delavayi*. * These two species, originally tentatively referred by M. Franchet, in the absence of ripe fruit, to *Cathcartia*, are, as their distinguished author has most obligingly pointed out to the writer, true *Meconopses*, the ripe capsules recently received having valves that are only partially dehiscent. Still another possible species is the plant described by M. Franchet as *M. betonicæfolia*. It may well be a *Meconopsis* but the fruit is not ripe and from its evident close affinity to two Himalayan species that seem undoubtedly referable to *Cathcartia* this may also prove to be better placed in that genus. From Hupeh the already mentioned *M. Oliveriana** is the only species as yet recorded; like *M. chelidonifolia* it also occurs in Szechuen.

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* Meconopsis lancifolia *Franchet MSS.* in *Herb. Paris.* Cathcartia lancifolia *Franchet Bull. Soc. Bot. Fr.* xxxii. 391 (1886). Meconopsis Delavayi *Franchet MSS.* in *Herb. Paris.* Cathcartia Delavayi *Franchet, Bull. Soc. Bot. Fr.* xxxii. 390 (1886).

From what has been said it will be clear that the home of *Meconopsis* is the conjoint Himalo-Tibetan and Tibeto-Chinese regions. But while this is the case there are three species that do not occur within this area and that exhibit a distribution which, even for outliers, is remarkable and peculiar. One species *M. cambrica*, that on which Viguier originally founded the genus, is confined to Western Europe, where it extends from Portugal to Wales, Cumberland and Strath-Clyde, thus overlying the western fringe of the *Papaver* area as *M. aculeata* overlies its eastern fringe. And strangely enough its nearest allies in the genus would seem to be *M. chelidonifolia* and *M. Oliveriana*—precisely the species from which it is furthest separated geographically. The two remaining species *M. crassifolia* and *M. heterophylla* occur in Western America. These are altogether anomalous in having valves which dehisce like those of *Papaver* by short subquadrate pores and in having their stigmatic lobes discrete as in *Chelidonium* or in *Argemone*. More disconcerting still is the fact that in the same area there occur two true *Papavers*, *P. californicum*, and *P. Lemmoni*, the former with a perfectly normal disc, the latter with an umbonate one like *Papaver stylatum*, while all four species are so very nearly related that it is only by an examination of their ripe capsules that they are to be definitely separated. It is not therefore surprising that so careful an observer and so great an authority on Californian species as Prof. E. Greene proposes to treat all four as congeneric. Whether, as he proposes, all should be treated as *Papavers* is a matter that requires, in the writer's opinion, further consideration. It is true that in the genus *Papaver*, as at present understood, are included a number of forms nearly allied to *P. armenaiacum* which have valves that dehisce like *Meconopsis* valves and have stigmas of the normal *Meconopsis* type, so that they differ from *Meconopsis* only in the absence of any style But it does not seem necessary on this account to propose that we should return to the view adopted by Linnæus as regards the European, and by Don as regards the Himalayan species, and speak of all the *Meconopses* as *Papavers*.

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* Meconopsis Oliveriana *Franchet & Prain MSS.* in *Herb. Paris.* and in *Herb. Kew.* Stems tall copiously branched, setulose below, glabrous above; leaves numerous, lower and middle shortly petioled sparingly strigose on both surfaces as are the upper sessile somewhat amplexicaul, ovate-oblong pinnatipartite; segments 1-2-jugate petiolulate ovate pinnatifid, lobes rounded obtuse, terminal segment deeply 3-fid: peduncles numerous slender and sepals glabrous; flowers solitary at the end of stem and of the many axillary always leafy branches; capsule long cylindric 4-5-valved, glabrous; placentas nerviform.

CHINA: Szechuen, Tchen-kéou-tin, *Farges* n. 390! Hupeh; *Henry* n. 6863!

Stems erect 2-3 ft. high, as thick as a swan's quill at base, flowers 8–12 terminal; buds globose; style very short and thick; capsule including style 1½ in. long, ¼in. across; rootstock villous.

This species so closely resembles in all its vegetative characters *M. chelidonifolia* Franchet, that at first it is hard to believe that they can be distinct. The fruit is however totally different; in *M. chelidonifolia* the capsule is short, ovate, ¾ in. long, and ½ in. across, the style is distinct and slender and the placentas are deeply intruded as they are in the true Poppies. Another difference is in the colour of the petals which seem, judging from dried specimens in Herb. Paris, to be purplish; certainly they are not bright yellow as in *M. chelidonifolia*. Both species much resemble *Cathcartia villosa*.

Another point of interest in the genus is the number of petals. This is given in most systematic treatises as 4. In the three species *M. cambrica*, *M. chelidonifolia*, *M. Oliveriana*, forming the *Chelidonifoliæ*, this is the case, as it is in the *Anomalæ* (*M. heterophylla*, *M. crassifolia*) and in the *Robustæ* (*M. robusta*, *M. paniculata*, *M. superba*, *M. napaulensis*, *M. Wallichii*). Among the *Aculeatæ*, *M. aculeata* and *M. sinuata* would appear to be always 4-petaled, but with *M. horridula* the exceptions are quite as frequent as the rule. In *M. bella* which may have 4 petals we usually find 5; while in two groups—the *Grandes* (*M. simplicifolia*, *M. quintuplinervia*, *M. punicea*, *M. grandis*, *M. integrifolia*) and the *Primulinæ* (*M. Henrici*, *M. primulina*, *M. lancifolia*, *M. Delavayi*)—we by no chance ever find 4 petals; in all these species we find, as in *Sanguinaria*, 5-8 or 9 petals imbricately spirally arranged. Yet there is no doubt, in spite of this divergence from the characters usually ascribed to the genus that these species are genuine *Meconopses*.

§ 1. Aculeatæ. *Stems, leaves, sepals and ovaries prickly; stigmas pyramidal; flowers pale purple, usually* Papaveroid, i.e., *with* 4 *petals*; (*occasionally in* M. horridula VAR. typica *and usually in* M. horridula VAR. racemosa *with petals* 5–8).

1. (2.) MECONOPSIS HORRIDULA H. f. & T.

VAR. *typica;* scapes radical one-fld; leaves membranous entire. M. horridula *H. f. & T. Flor. Ind.* 252 (1855); *Walp Ann.* iv. 171 (1857). *Flor. Brit. Ind.* i. 118 (1872).

SIKKIM: Kongra-Lama, Bomtso and Kan-ka-la, 14-17000 ft. abundant, *Hooker!* Kan-kra-la and Donkia, *G. Gammie! Cummins!* CHUMBI: at Te-ling, *Dungboo!* DISTRIB. Central Tibet (*Rockhill!*) and South-Eastern Tibet (*Thoroll! King's Collectors!*)

VAR. *racemosa;* some or all of the scapes agglutinated to form a leafless grooved stem with pseudo-racemose inflorescence and bractless pedicels; leaves membranous entire or (rarely) dentate. M. racemosa *Maxim. Bull. Acad. Petersb.* xxiii. 310 et *Mel. Biol.* ix. 713 (1876); *Forbes & Hemsl. Journ. Linn. Soc.* xxiii. [*Ind. Sinens.* i.] 34 (1886); *Maxim. Flor. Tangut.* i. 36. t. 9. f. 1–6 et t. 23. f. 26 (1889).

SIKKIM: Ta-ne-gang, Gia-gong and near Cho-la, *King's Collectors!* Lachung, *Dungboo!* Tankra-la (specimens with deeply dentate leaves), *G. Gammie!* CHUMBI: Sham-chen, *Dungboo!* Ta-Chey-Kung, *King's Collectors!* DISTRIB. North Tibet (*Przewalski!*) Central Tibet (near Lhassa, *Dungboo!*) Northern Szechuen (*Potanin!*)

It is impossible to sustain the specific rank claimed for this form. In the northern and central portions of the area inhabited by the species the two forms come from adjacent districts. In Sikkim, the extreme southern limit of its geographical distribution, the two forms grow intermixed; all our Calcutta gatherings, as well as Hooker's original ones, show transitions from the one to the other.

[VAR. *rudis*; stems like those of VAR. *racemosa* but taller, thicker, hardly grooved and leafy at the base with the lower pedicels bracteate; leaves very thick with subsinuate margins and very sparsely prickly as are the sepals and stems; capsules small, hardly exceeding in diam. the much expanded torus. M. racemosa *Franchet*, *Bull. Soc. Bot. Fr.* xxxiii. 38 (1886); *Plant Delavay.* 41 (1889) *vix Maxim.*

YUNNAN: Li-kiang, *Delavay!*

This plant, united by M. Franchet with Mr. Maximowicz' *M. racemosa*, certainly differs varietally in the points noted.]

The suggestion made in the *Flora Indica* and again in the *Flor. Brit. Ind.* that *M. horridula* may after all be no more than an Alpine form of *M. aculeata* has not, so far, been supported by the collection of the necessary intermediate forms. On the contrary the facts of distribution among the members of the *Aculeatæ* group point decidedly in the opposite direction. Although *M. aculeata* has capsules remarkably like those of *M. horridula* its torus is not thickened, its leaves are widely dissimilar, its stem is leafy and its pedicels are bracteate.

2. (3.) MECONOPSIS ACULEATA *Royle, Ill.* 67. t. 15 (1839); *Walp. Rep.* i. 110 (1842); *H. f. & T. Flor. Ind.* 253 (1855); *Walp. Ann.* iv. 171 (1857); *Klotzsch, Reis. Pr. Waldem.* 129 (1862); *Hook. Bot. Mag.* t. 5456 (1864); *H. f. & T. Flor. Brit. Ind.* i. 118 (1872). M. Gulielmi-Waldemari *Klotzsch, Reis. Pr. Waldem.* 129. t. 36 (1862); *Walp. Ann.* vii. 86 (1868). M. napaulensis *Jacquem. MSS. in Herb. Paris; Falc. MSS.* in *Herb. Saharanpur; nec* M. napaulensis *DC. Wall. Cat.* n. 8122!

It is not possible to accord even varietal rank to the form figured and described by Klotzsch as *M. Gulielmi-Waldemari*.

3. (—.) MECONOPSIS SINUATA *Prain*; prickly, stem leafy, leaves oblong-lanceolate, flowers pale blue-purple; capsules long narrowly obconic, sparsely prickly.

VAR. *typica*; leaves obtuse with sinuate margins.

SIKKIM: Patang-la, Pey-kiong-la and Ney-go-la, *King's Collectors!* Jongri, *G. Gammie!* BOOTAN: Dichu Valley, *Cummins!*

[VAR. *Prattii*; leaves subacute serrate or subentire.

SZECHUEN: near Tachienlu, *Pratt.*, n. 525!]

Rootstock stout, fusiform; *stems* 1-3 ft. smooth except for the scattered prickles. *Leaves* 4-7 in., long petioled, upper cauline sessile. *Cymes* few-fld., *flowers* 2-3 in. diam., pedicels bracteate slender fastigiate in fruit, prickly; petals 4. *Capsule* 1¼–1½ in. sparsely prickly, ultimately subglabrous; style ¼–½ in.; stigma small. *Seeds* scaberulous hilum slightly crested.

This species has much the habit of *M. aculeata* of which it appears to be in the Eastern Himalaya the representative form. It has however different leaves and a totally different capsule with a much smaller stigma. The plant here described as VAR *Prattii* has leaves quite like those of *M. horridula* VAR *racemosa* though of somewhat thinner texture. But besides having bracteate pedicels it differs in having an unexpanded torus and a much less aculeate ovary. The capsules of VAR. *Prattii* are unfortunately not yet ripe but they agree exactly with those of typical *M. sinuata* at a similar stage and are totally unlike those of *M. horridula* or *M. aculeata* at any stage.

§ 2. Robustæ: *Tall often branching; stems, leaves and sepals hirsute or pubescent; ovaries setose; stigmas capitate; leaves pinnatifid to -partite, radical many withering, cauline numerous all scattered; flowers Papaveroid*, i.e., *with 4 petals.*

4. (4.) MECONOPSIS ROBUSTA *H. f. & T. Flor. Ind.* 253 (1855); tall, glaucescent, glabrous or sparsely crinite with soft flexuous spreading hairs, leaves pinnatifidly lobed, lobes rounded acute, tips of peduncles and sepals sparsely patently crinite; cymes simple, flowers sulphur yellow, margins of petals crenulate; capsule obovate-oblong 8–11-valved, sparingly covered with adpressed sub-deciduous setæ. *Walp. Ann.* iv. 171 (1857). M. nipalensis *Hook. f. Bot. Mag.* t. 5585 (1866) *nec DC. et vix H. f. & T. Flor. Ind. & Flor. Brit. Ind.* M. robusta *H. f. &. T. Flor. Brit. Ind.* i. 118 (1872) *in part; excluding the Nepal plant and the citation* Wall. Cat. 8121. Argemone mexicana *Wall. Cat.* 8126 E (1830) *nec Linn. Wall. Cat.* n. 8124!

WESTERN HIMALAYA: Kamaon, 8–10,000 ft. *Blinkworth* in *Wall. Cat.* n. 8124! 8126 E! and in a third specimen without number in the Wallichian type herbm.! Nanik, *Strachey and Winterbottom!* Chenab Valley, *Stewart! Ellis* n. 1362! 1471! near Mussoorie, *King!* Pindi, *Collett!* Palang Gadh, Byaus; above Ramri; and Galmar, 10–12,000 ft., *Duthie!*

Stems simple or branched 4–6 ft high almost 2 in. thick at base; cymes lax-fld. 1-2 ft. long, flowers 2-3 in across; sepals ½ in.; styles thickened at base ¼ in long; capsule, including style, 1¾ in.

This species, apparently strictly confined to Kamaon though not at all uncommon there, is perhaps only a geographical form, certainly is the western representative of the next species, from which it only differs in the want of fine pubescence intermingled with its long hairs, in the somewhat different lobulation of its leaves and in the margins of its petals being crenulate. In the *Flora Indica* Hooker and Thomson have cited only the Kamaon locality and only Wallich's n. 8124, and 8126, both of which came from that province, for their species. The description given, however, of the capsule applies rather to Wallich's n. 8121 from Nepal which is cited as equivalent to n. 8124, in the *Flora of British India*, where the locality Nepal is also given for the species. But the plant thus included (*Wall. Cat.* n. 8121) is *not* the same as the Kamaon one; it is the true *M. napaulensis* of *DC.* [*Prodr.* i. 121]—the crimson-flowered portion of *Stylophorum paniculatum* of *G. Don* [*Gen. Syst* i. 135]—and is not distinguishable from the *M. Wallichii* VAR *rubrofusca* of *Bot. Mag.* t. 6760. This plant agrees with *M. robusta* in having hirsute, but not tomentose, stems, leaves and sepals, but differs in having dark-red instead of yellow flowers and in having a narrower capsule with reddish spreading instead of adpressed or ascending yellow setæ with about half the number of valves and with a longer style slender throughout.

5. (5.) MECONOPSIS PANICULATA *Prain* ; tall stout hirsute with soft flexuous spreading hairs and densely clothed with a soft substellate golden-yellow or grey pubescence ; leaves linear-oblong or oblanceolate sinuately lobed, lobes widely-triangular-toothed, cymes paniculate or simple ; flowers yellow, margins of petals entire ; capsule obovate-oblong 8–11-valved densely covered with ascending subpersistent setæ and with close stellate pubescence.

VAR. *typica* ; cymes paniculate, pedicels subfastigiate branched longer than the leaves even in flower sepals sometimes only puberulous. Papaver paniculatum *D. Don, Prodr. Flor. Nep.* 197 (1825). Stylophorum paniculatum *G. Don, Gen. Syst.* i. 135 (1831) *in part only and as to the yellow-fld. plant cited.* Meconopsis napaulensis *Walp. Rep.* i. 110 (1842) *not of DC.* Meconopsis Wallichii *H. f. & T. Flor. Ind.* 254 (1855) *Walp. Ann.* iv. 171 (1857) ; *H. f. & T. Flor. Brit. Ind.* i. 119 (1872) *in part only and as to the citation* Wall. Cat. n. 8123/b ; *not of Hook.* Polychætia paniculata *Wall. MSS.* in *Herb. Wall.* n. 8123/b.

NEPAL : Gossain Than ; *Wallich.* n. 8123/b ! SIKKIM : Jongri, *King's Collectors !* Ling-tu, *King's Collectors !* Phalloot, 10,000 ft., *King's Collectors !* Lachung and Tankra, 11,000 ft., *G. Gammie !* BOOTAN : Tak-poo, *Dungboo !*

VAR. *elata* ; cymes simple, pedicels usually solitary, sometimes 2 together, spreading ; not or hardly longer than the leaves in flower, elongating and fasciculate in fruit. Meconopsis nipalensis *H. f. & T. Flor. Ind.* 253 (1855) ; *Hook. f. Ill. Him. Pl.* t. 9 (1855) ; *Walp. Ann.* iv. 171 (1857) ; *H. f. & T. Flor. Brit. Ind.* i. 118 (1872) : M. nepalensis *Lemaire, Ill. Hortic.* iii. 95 (1856) — *not* M. napaulensis *DC.* M. Wollastonii *Regel, Gartenfl.* xxv. 291 (1876) *name only.* *Wall. Cat.* n. 8123/a.

CENTRAL HIMALAYA : *Wallich*, n. 8123/a ! SIKKIM : Lachen, *Hooker !* Natong, *Dungboo !* Patang-la, *King !* Jongri, *King's Collectors !* Singalelah, *G. Gammie !* Lachung, *G. Gammie !*

Stems sparingly branched or simple 3–5 feet high, 2–3 in. thick at base ; radical and lower cauline leaves petioled 6–18 in. long ; cymes lax-fld. 1–2 feet long conspicuous ; sepals in VAR. *typica* ½–¾ in., in VAR. *elata* 1 in. long ; flowers in VAR. *typica* 2 in., in VAR *elata* 3 in. diam. ; style thickened at base ½ in. long ; capsule, including style, 1½–2 in.

Except for the more branching habit, the smaller amount of gross pubescence and the smaller flowers in VAR. *typica* there is nothing to separate the two varieties which pass into each other by many intermediates and are only sustained here in order the more easily to explain the somewhat complex synonymy which has arisen from the inadequacy of the material in European Herbaria. In some cases VAR. *typica* has only a close stellate pubescence and then remarkably resembles *M. Wallichii*, but even if the colour of the petals has not been noted the ovaries with 10–11-placentas and the 10–11-lobed stigma, or at a later stage the larger ovate 10–11-valved capsule with shorter style much thickened below and the altogether different pubescence of the capsule amply distinguish this from *M. Wallichii*.

That *Wall. Cat.* n. 8123/b is D. Don's *Papaver paniculatum* is made certain by the fact that Don has himself written this name on the type sheet of Wall. Cat. n. 8123/b, which moreover retains the original field ticket on which Wallich has written the MSS name *Polychætia paniculata*. D. Don has at the same time identified n. 8123/b with *Meconopsis napaulensis* DC.; this identification is quite erroneous; *Meconopsis napaulensis* forms the red-flowered portion of G. Don's *Stylophorum paniculatum* whereas D. Don's *Papaver paniculatum* forms the yellow-flowered portion of G. Don's *Stylophorum paniculatum*. Hooker and Thomson on the other hand have assigned the name *M. nipalensis* to *Wall. Cat.* n. 8123/a, and have referred *Wall. Cat.* n. 8123/b to *M. Wallichii* in this following Sir W. Hooker who does not however include Wallich's yellow-flowered Nepal plant in his description of the blue-flowered Sikkim one though he cites the sheet itself. Besides being both, as it now transpires, truly conspecific, neither of the portions of Wallich's n. 8123 agrees at all well with the original description of *M. napaulensis*; that description applies alone among the Himalayan species, to *Wall. Cat.* n. 8121 and a comparison of that number with the original *M. napaulensis* in Mr. C. de Candolle's "Prodromus Herbarium" shows them to be identical.

The precise locality of *Wall. Cat.* n. 8123/a is doubtful. The original field ticket is missing; in the *Lith. Cat.* list it stands as "Kamaon?" This citation is almost certainly wrong; for the species does not occur amongst the plants sent by Blinkworth from Kamaon, and no collector has found it in Kamaon since Blinkworth's time. In all probability, *Wall. Cat.* n. 8123/a, like n. 8123/b, came from Nepal.

6. (—.) MECONOPSIS SUPERBA *King;* tall stout hirsute with soft flexuous spreading hairs and densely clothed with soft grey pubescence; leaves obovate oblong serrate; cymes simple; flowers white margins of petals entire; ovary globose 7–11-valved densely clothed with adpressed setæ and with close stellate pubescence.

BOOTAN: Ho-Ko-Chu, *Dungboo!*

Stems simple, apparently 6 ft. high, 1½ in. thick within 2 feet of top; cauline leaves sessile amplexicaul 10–20 in. long; cymes rather dense-fid, pedicels 2–3 in each axil; sepals 1¾ in. long; flowers nearly 4 in. diam.

This very fine plant is perhaps only a form of *M. paniculata* VAR. *elata;* the chief differences are the larger size of all its parts, the white, not yellow, petals and the serrate but not lobed cauline leaves. The ovary is exactly like that of *M. paniculata*; ripe fruit is as yet unknown.

7. (—.) MECONOPSIS NAPAULENSIS *DC. Prodr.* i. 121 (1824); tall glaucescent sparsely hirsute with soft flexuous spreading hairs rarely also thinly substellately pubescent, leaves lobed pinnatipartite or lyrate-pinnatisect lobes rounded-oblong widely crenate-dentate; cymes simple or paniculate, tips of peduncles and sepals patently hirsute,

flowers dark fuscous-purple, capsules subcylindric or narrowly ovate 4–6-valved, densely covered with harsh setæ at first yellow and adpressed at length rufous and spreading or subreflexed. Meconopsis robusta *H. f. & T. Flor. Brit. Ind.* i. 118 (1872) *in part and as to the Nepal plant cited* (Wall. Cat. n. 8121) *not of H. f. & T. in Flor. Ind.* M. Wallichii VAR. rubrofusca *Hook. f. Bot. Mag.* t. 6760 (1884). Stylophorum nepalense *Spreng. Syst.* iv. cur. post. 203 (1827). S. paniculatum *G. Don, Gen. Syst.* i. 135 (1831) *in part only and as to the crimson-fld. plant cited.*

NEPAL: Gossain Than, *Wallich* n. 8121! Thari, in Eastern Nepal, *King's Collectors!* SIKKIM: Tehni-Zen *King's Collectors!* Tiamphung and elsewhere in Jongri, frequent, *King's Collectors!*

Stems simple 2–5 feet high, ½–1 in. thick at base; flowers nodding, 3 in. in diam.; lower cauline leaves long-petioled; sepals rather densely crinite but not or sparsely stellate-pubescent; petals broadly obovate-oblong; capsules ½–1 in. with a slender style ½–¾ in. long.

The *bibliographical* relationship of this species to *M. robusta* and *M. paniculata* has been already explained. From both it is readily distinguished by its dark purple not yellow flowers, by its smaller capsule with fewer valves and very different setæ, and by its much longer slender style. Its association with *M. robusta* has been due to both having rounded lobes of leaves and to the two having very similar sepals. Its identification with *M. paniculata* has been the result of a misapprehension on the part of Mr. D. Don who, of the two *Meconopsis* collected by Wallich in Nepal, has, contrary to M. de Candolle's explicit statement, selected the many-valved one as the equivalent of the *Prodromus* species. Mr. G. Don has attempted to overcome the difficulty thus created by treating these two Nepal plants, the red and the yellow-fld., as conspecific. This is however impossible for the *botanical* relationship of *M. napaulensis* is, as Sir Joseph Hooker has clearly shown, in the most recent notice of this species (*Bot. Mag.* t. 6760), with *M. Wallichii.* It has many of the characters of that plant but besides having dark-red-, in place of pale-blue-purple flowers it is easily distinguished by its leaves and sepals being patently crinite with long hairs and by having very little, usually indeed none, of the close stellate pubescence that characterises the leaves and sepals of *M. Wallichii* where on the other hand there are none of the long hairs of *M. napaulensis.* This species has only recently been successfully introduced into European Gardens, plants having been reared by Mr. G. Wilson in his garden at Weybridge from seeds sent by Dr. King. It may ultimately be satisfactorily proved that Sir Joseph Hooker's suspicion, which the writer shares, that this and *M. Wallichii* are only forms of one species, is correct. In that case the name *M. Wallichii* which has become familiar in European horticulture will have to give way to the older name *M. napaulensis,* which is at present, but quite erroneously, associated in European gardens with Wallich's yellow-fld. species. In the meantime however it is more satisfactory and less misleading to treat *M. napaulensis* and *M. Wallichii* as specifically distinct.

8. (6.) MECONOPSIS WALLICHII *Hook. Bot. Mag.* t. 4668 (1852); *Jard. Fleur.* iii. t. 315 (1853); *Belg. Hortic.* iv. t. 18 (1854); *Flore des*

Serres, viii. t. 735 (1855); *H. f. & T. Flor. Ind.* 254 (1855); *Walp. Ann.* iv. 171 (1857); *H. f. & T. Flor. Brit. Ind.* i. 119 (1872) *excluding in all cases the citation* Wall. Cat. 8123/b *and the Nepal locality.*

This is the pale-blue-fld. paniculate "Poppy" familiar to all travellers in Sikkim. Dr. King's Collectors have brought it also from Chumbi (Sham-Chen) and Dr. Cummins has sent specimens to Calcutta from Bootan (Dichu Valley) but though it thus extends further to the east than the *F. B. I.* indicates it has not as yet been collected in Nepal. The plant has long been cultivated in Europe, seeds having first been sent home by Sir Joseph Hooker in 1848 and plants having been reared at Kew by Sir William Hooker who figured and described the species. Sir William identified with this the paniculate form of Dr. Wallich's yellow-flowered Nepalese species which is often remarkably like this pale-purple-fld. plant, until ripe fruit is obtained. There is however no possibility of confounding the capsules of the two — those of *M. Wallichii* are smaller and narrower with 5–6 valves, with spreading rufous setae and a longer slender style; the yellow-fld. plant has longer widely-ovate capsules with 8–11 valves, setae that are less patent and that remain yellow throughout and a shorter style much thickened at the base. One result of the identification of these two plants has been that the *Meconopsis* named in Dr. Wallich's memory is one that he never collected or distributed.

§ 3. Primulinæ. *Stems very short simple, leaves and sepals glabrescent; ovaries glabrous (in a Chinese species strigose at apex); stigmas cleft or 2-lobed; leaves simple entire, radical few vanishing, cauline numerous close-set and pseudo-radical; flowers Sanguinarioid i. e. with* 6–9 *petals.*

9. (—.) Meconopsis primulina *Prain*; almost glabrous, stem short leafy at the base only, leaves linear-oblong entire acute, radical few spathulate, all narrowed into short petioles and very sparsely strigose on both surfaces flowers on a terminal and one to two axillary scapes pendulous dark violet-purple; sepals 2 glabrous, petals 6–8 imbricate narrowly ovate with a distinct claw; stamens about 50, filaments filiform as long as the ovary, anthers orbicular-ovate golden-yellow; ovary glabrous 4-carpelled narrowly ovate tapering into a slender style ⅓ as long; stigmas 2-partite lobes oblong plano-convex, outer convex surface 2-stigmatic.

Bootan: Do–lep, *King's Collectors!* Chumbi: Sham-Chen, *Dungboo!*

Rootstock fusiform 1–4 in. long, neck clothed with old sheaths; leaves 1½–2½ in. by ¼ in.; central scape 7 in., lateral 3–4 in.; sepals ½ in., petals ¾ in. long, ¼–½ in. wide, inner narrower; filaments of the outer series often united into petaloid phyllomes with antheriferous fringe; ovary ⅜ in. long, 3/16 in. wide, placentas far intruded and passing up the substance of the style as 2 pairs of approximated traces, each trace bearing at the base of the style a projecting papilla laterally inclined so that the 4 papillæ are in 2 pairs alternate with placental traces and style lobes and opposite the stigmatic cleft, outer stigmatic loops alternate with placentas. The capsules though apparently full-grown are unripe.

The nearest ally of this species is *Meconopsis Henrici*, Franchet [*Journ. de*

Botanique v. 19 (1891,] from Szechuen which has more numerous leaves, also close-set on a short stem and not truly radical, more numerous stouter scapes and rather larger flowers that though nodding in bud are not nodding when full-blown. *M. Henrici* has however a very different ovary which is depressed globose, strigose in its upper half and considerably shorter than the style. In M. Franchet's species the same peculiar grouping of the filaments of the outer series in flat phalanges is also sometimes met with but there are no epaulettes of papillæ on the capsule. Another species in which the leaves and stems are exactly like those of *M. primulina* is *Meconopsis lancifolia* Franchet, from Yunnan. This has a glabrous ovary and short style and except in wanting the epaulettes and having a less deeply lobed stigma hardly differs from *M. primulina*. The flowers too are almost identical but instead of having a few flowers on long scapes, it has numerous flowers arranged in a racemose cyme with the pedicels bractless as in *M. horridula* VAR. *racemosa*, while the sepals are slightly and the stem and pedicels are rather densely strigose.

Another Yunnan species of this group is *Meconopsis Delavayi* Franchet, of which the flowers are exactly as in *M. lancifolia*, *M. Henrici* and *M. primulina* but which has solitary scapes and crowded very long-petioled pseudo-radical leaves with small spathulate-hastate blades.

§ 4. Grandes. *Stemless or with simple stems, leaves and sepals softly hairy; ovaries hispid; stigmas large capitate ridged; leaves simple entire (in the Chinese) or dentate (in the Indian species), radical very numerous persisting, cauline, if present, few scattered below, whorled above; flowers Sanguinarioid i.e. with 5–8 petals.*

10. (—.) MECONOPSIS GRANDIS *Prain;* softly hairy, radical leaves tufted numerous ovate-lanceolate coarsely serrate, tapering into a long petiole; cauline leaves shortly petioled or sessile; flowers large very deep blue; ovary subcylindric sparingly covered with harsh spreading ultimately subdeciduous hairs; placentas 5, slightly intruded; style ⅓ the length of ovary; capsule linear-oblong.

SIKKIM: Jongri, in Western Sikkim, very common at 10–12,000 feet, *King's Collectors! Watt* n. 5435! *G. A. Gammie!*

Rootstock stout, clothed with sheaths, neck villous; radical leaves 3½–7 in. by 1–2 in. with petioles 6–9 in. long; stem 1½–3 ft. high leafy, leaves passing into bracts, the lower 1–3 scattered, the upper 3–5 collected in a whorl, lowest shortly petioled vacant, the next 1–2 with axillary flower-buds: bracts of the whorl subequal 5–6 in. by 3 in. with 1–2 axillary flowers; main axis terminating in a 1-fld. scape extending 6–18 in. beyond whorl; sepals 2 hairy, petals 5–7 imbricate, buds 1½ in., flowers 5 in. diam.; stamens ∞; capsules 2½ in. long, seeds rugose.

This one of the finest species of *Meconopsis* in the Himalayas, is evidently, in spite of its great difference of habit, very closely allied to *M. simplicifolia* with which it agrees in having tufted coarsely dentate radical leaves and of which it has exactly the capsules and the seeds. It is also nearly related to *Meconopsis integrifolia* Franchet [*Bull. Soc. Bot. Fr.* xxxiii. 389 (1886) et *Plant. Delavay.* 41 (1889); *Maxim. Flor. Tangut.* i. 35 t. 9. f. 7–12 et t. 22. f. 23–25 (1889): Cathcartia integrifolia *Maxim Bull. Ac. Imp. Petersb.* xxiii. 310 et *Mel. Biol.* ix. 713 (1876); *Forbes & Hemsl. Journ. Linn. Soc.* xxiii. (*Ind. Sinens.* i.) 34 (1886)] which agrees with *M. grandis* in having tufted radical leaves and in having a stem that, though shorter, has also 1–2 scattered leaves below and a whorl of 5–8 bracts with 2–3 axillary as well as a terminal flower above, but which differs in having all the leaves entire, in having yellow in place of dark purple flowers, and in having a very short style with a rather larger stigma. Of the two, *M. integrifolia* is perhaps the more beautiful species; both must prove, when ultimately introduced, great acquisitions to European horticulture. *M. grandis* seems to be confined to the district of Jongri but is very plentiful there.

11. (—.) MECONOPSIS SIMPLICIFOLIA *Walp. Rep.* i. 110 (1842); *H. f. & T. Flor. Ind.* 252 (1855); *Hook. f., Ill. Him. Pl.* t. 8 (1855); *Ill. Hortic.* iii. 114 (1856); *Walp. Ann.* iv. 170 (1857); *Flore des Serres* xiii. t. 1324 (1858); *Flor. Brit. Ind.* i. 118 (1872). Papaver simplicifolium *D. Don, Prodr. Fl. Nepal.* 196 (1825) Stylophorum simplicifolium *Spreng. Syst.* iv. cur. post. 203 (1827); *G. Don, Gen. Syst.* i. 135 (1831). *Wall. Cat.* n. 8125.

The species most nearly related to *M. simplicifolia* is *M. quintuplinervia* Regel [*Gartenfl.* (1876) 291, t. 880, f. *b. c. & d.*; *Maxim. Flor. Tangut.* 34. t. 23. f. 27 (1889)] from Northern Tibet and Kansu. *M. quintuplinervia* differs from the Himalayan species in having entire leaves, filaments sub-2-seriate those of the outer rather shorter series being moreover slightly dilated upwards. A second closely allied species is *M. punicea* Maxim. [*Flor. Tangut.* 34. t. 23. f. 12–21 (1889)] which also differs from *M. simplicifolia* in having entire leaves but is further easily distinguished from both *M. simplicifolia* and *M. quintuplinervia* by having much longer and narrower petals and by having a short globose ovary with a much larger almost sessile stigma.

§ 5. Bellæ. *Stemless; scapes, leaves, sepals and ovaries glabrous, stigmas small capitate; leaves 2–3-pinnatifid all radical numerous persisting, flowers sub-Papaveroid, i.e. petals* 4 or 5.

12. (—.) MECONOPSIS BELLA *Prain, Journ. As. Soc. Beng.* lxiii., pt. 2, 82 [*Noviciæ Indicæ* vii. 71] (1894).

This species is, as already mentioned in this work, very distinct from any hitherto reported *Meconopsis* and represents a group not very closely related to any of the preceding. This also, when ultimately introduced, must prove a great acquisition to European horticulture.

4. (—.) RŒMERIA MEDIK.

Annual herbs with yellow juice; leaves petioled pinnatipartite with multifid lobes; flowers in cymes, on slender leaf-opposed pedicels; sepals 2, petals 4 violet-purple, with a dark basal eye; stamens numerous; ovary linear, stigmas 2–4-lobed sessile; rays opposite the many-ovuled placentas. *Capsules* elongated, 3–4-valved, 1-locular, dehiscing throughout their length; seeds scrobiculate, without crests. Species 2; Mediterranean and Oriental.

Key to the Indian Species.

* Capsule uniform, setose; filaments filiform ... 1. *R. hybrida.*

* * Capsule narrowed upwards, glabrous; filaments dilated 2. *R. refracta.*

The area occupied by *Rœmeria* is the conjoined Mediterranean and Oriental regions so that only the merest fringe of their area comes within the limits of the Indian Empire. Like *Papaver* therefore *Rœmeria* is not really an Indian genus. The nearest natural allies of its species are the prickly-capsuled members of *Papaver* § *Rhœades* from which they only differ in having valves that dehisce throughout instead of by pores. By this character *Rœmeria* approaches *Cathcartia* and that so closely that, as originally defined, *Cathcartia* differs only from *Rœmeria* in having crested seeds and differently coloured flowers. A new *Cathcartia* from Sikkim, however, agrees with *Rœmeria* in both characters; but for the presence of a style, not admitted in the original definition, in the species of *Cathcartia*, that genus must have been merged in *Rœmeria* from which it therefore only differs by the character that separates *Meconopsis* from *Papaver*. The place usually assigned to *Rœmeria* in taxonomic works is close to *Chelidonium* and *Glaucium*; the arrangement is neither natural nor convenient.

1. RŒMERIA HYBRIDA *DC. Syst. Veg.* ii. 92 (1821); leaves pinnatifid to -sect; filaments subulate; capsule uniformly patently setose.

VAR. eriocarpa *DC. Syst.* ii. 93 (1821); leaf segments oval oblong, flowers small. R. pinnatifida *Boivin* in *Belang. Voy. Ic.* t. 2 (1838). R. orientalis *Boiss. Ann. Sc. Nat.* ser. ii. xvi. 374 (1841); *Flor. Orient.* i. 118 (1867). R. Schimperi *Presl., Bot. Bemerk.* 8 (1843). R. hybrida VAR. δ. *H. f. & T. Flor. Ind.* 257 (1855); *Walp Ann.* iv. 174 (1857).

NORTH-WEST FRONTIER: British Beluchistan; *Hamilton! Duke! Duthie! Lace!* DISTRIB. (of species) Westward to Spain: (of variety) Beluchistan, Afghanistan and Persia to Egypt.

Flowers 1 in. in diam. Capsules 1–2 in long more or less copiously setose alike on placental ribs and valves. The variety hardly differs from the typical *R. hybrida*, which in the true Mediterranean region is itself very variable, except in the shape of the leaf segments and the smaller size of flowers and fruit.

All the specimens from British territory belong to this variety, which Boissier and others treat as a species. If so dealt with it should however be noted that the oldest name is not Boissier's one of *R. orientalis*, but Belanger's one of *R. pinnatifida*. The oldest name for the species as a whole is *R. violacea* Medik [*Ust. Ann.* iii. 15 (1792)] but that employed by DeCandolle being in more general use I have continued its employment.

2. RŒMERIA REFRACTA *DC. Syst. Veg.* ii. 93 (1821); leaves 2-pinnatipartite segments linear; flowers large filaments dilated; capsule narrowed at the tip, glabrous. *Delessert, Icon. Select.* iii. t. 8 (1823); *DC. Prodr.* i. 122 (1824). R. rhœadiflora *Boiss. Diagn.* ser. i. vi. 7 (1845); *Flor. Orient.* i. 119 (1867). R. hybrida VARS. β. γ. *H. f. & T. Flor. Ind.* 257 (1855); *Walp. Ann.* iv. 174 (1857).

NORTH WEST HIMALAYA: Badakshan, *Giles!* DISTRIB. Afghanistan, Beluchistan, Turkestan, Persia, Armenia.

Flowers 2 in. in diam. Capsules 1–2 in. long, without setae on the valves, sometimes with a few along the placental ribs.

When M. Boissier in 1845 first defined *R. rhœadiflora* he considered it a species apart from *R. refracta* ; the only character, however, by which he could diagnose his species was that its pedicels did not turn down. There is however no character to separate the two and M. Boissier admits this when in the *Flora Orientalis* he includes under *R. rhœadiflora* the solitary gathering (Derbent, *Steven !*) on which the species *R. refracta* was founded ! By an oversight, however, he omits to cite the name that DeCandolle had already given to the specimens of this gathering, or to merge his own later name in it. The writer, who has examined both Steven's, and therefore DeCandolle's, as well as Boissier's original specimens is satisfied that Boissier is right in considering the two conspecific. And a note by Stocks, on the specimen in Herb. Calcutta of the gathering from Beluchistan identified by Boissier with *R. rhœadiflora*, shows that that botanist had already recognised the identity of Boissier's species with *R. refracta* DC.

5. (—.) GLAUCIUM Tournef.

Biennial or perennial glaucous herbs with yellow juice. Radical leaves rosulate petioled, cauline more or less amplexicaul incised or lobed. Peduncles axillary or terminal 1-fld. Sepals 2 ; petals 4, orange-yellow convolute, stamens numerous ; ovary linear ; stigma 2-lamellate sessile, lamellae erect, alternate with the placentas and projecting at each end so as to form conjointly two horizontal arms stigmatic above, opposite the placentas. Capsule a slender cylindric pseudo-siliqua, valves dehiscing throughout their length and leaving a pseudo-replum resulting from union of margins of intruded placentae, in which the seeds are semi-immersed. Seeds scorbiculate without crests. Species about 15 ; throughout the Mediterranean, Oriental and Central Asian regions.

Key to the Indian Species.

* Pods slender, not much thicker than peduncles, slightly torulose, contorted or irregularly curved, rarely straight 1. *G. elegans.*
* * Pods stout, nearly twice as thick as peduncles, not torulose, straight or only slightly regularly bent ... 2. *G. squamigerum.*

Like *Rœmeria* and *Papaver*, *Glaucium* is not a truly Indian genus. The difficulty of distinguishing satisfactorily the different forms has led in various taxonomic works to a great diversity of treatment. In the *Flora Orientalis* M. Boissier has distinguished thirteen *Oriental* species ; in *Acta Hort. Petrop.* (1887) Dr. Kuntze has proposed the extreme measure of reducing all the forms to one very variable species *Glaucium corniculatum*. Doubtless the truth lies somewhere between these two extremes. M. Boissier was an author of the greatest care and of the highest judgment and the various forms that he describes are at all events recognisable. And though it is possible to some extent to justify the view of Dr. Kuntze when the genus is looked at from the monographer's stand point, it is not necessary or advisable to adopt it when dealing with the flora of a given area. Besides, an examination of Kuntze's work does not leave the impression that he appreciates the value, even for varietal differentiation, of the characters exhibited by the varieties and sub-varieties which he recognises. Kuntze's later proposal, that the name *Glaucium*, owing to its similarity to the name *Glaux* (*Primulaceæ*), must give place to another, is mere pedantic trifling with a subject that has some claim to serious treatment.

1. GLAUCIUM ELEGANS *Fisch. & Mey. Ind. Sem. Hort. Petrop.* i. 29 (1835); glabrescent, radical leaves obovate-oblong pinnatifid, lobes shortly ovate crenately toothed; cauline cordate-amplexicaul broadly ovate obtusely toothed; sepals papillose, petals small orange with red eye; capsule slender, torulose, often contorted, sparingly setose with spreading prickles, seeds oblong-cylindric curved. *H. f. & T., Flor. Ind.* 255 (1855); *Boiss. Flor. Orient.* i. 120 (1867). G. pumilum *Boiss. Ann. Sc. Nat.* ser. ii. xvi. 374 (1841). G. squamigerum *Bunge, Rel. Bot. Lehm.* 192 (1847); *Boiss. & Buhse, Aufzähl.* (1860); *nec Kar. & Kir.*

NORTH-WEST FRONTIER: Kohat, at Mirkhworli, *Drummond!* DISTRIB. Afghanistan, Turkestan, and N. Persia to Armenia.

Stems 1 ft. or higher, slender much branched, radical leaves 1½–2 in., sepals ¼ in. long, buds ½ in diam.; flowers 1 in. diam.; capsule usually twisted 2–3 in. long, narrowed (subtorulose) between the seeds.

2. GLAUCIUM SQUAMIGERUM *Kar. & Kir. Bull. Soc. Mosc.* xv. 141 (1842); glabrescent, radical leaves lyrate-pinnatifid, lobes ovate wide toothed, terminal subquadrate; cauline cordate-amplexicaul, broadly oblong acutely lobed; sepals glabrous, petals orange-yellow; capsule straight or curved, sparsely setose; seeds reniform deeply pitted. *Regel & Herd. Bull. Soc. Mosc.* xxxvii. 406 (1864). G. persicum *Bunge, Rel. Bot. Lehm* 192 (1847) *nec DC.* G. corniculatum *H. f. & T. Flor. Ind.* 256 (1855) *nec Linn.* G. luteum VAR. fimbrillifera *Trautv. Bull Soc. Mosc.* xxxiii. 92 (1860). G. fimbrilligerum *Boiss. Flor. Orient.* i. 120 (1867).

NORTH-WEST HIMALAYA: Badakshan, *Giles!* N.-W. FRONTIER: Kach, *Lace!* Nal, *Duke!* DISTRIB. Beluchistan, Afghanistan, Turkestan, Soongaria.

Stems 1 ft. or higher, branching; radical leaves, 2–6 in., sepals ¾ in. long, buds ¼ in. or less in diam.; flowers 1½–2 in. diam., petals bright yellow (*Aitchison*); capsule usually slightly curved, 6–8 in. long; adpressed aculeate, flattened (scale-like) setae ultimately suberect.

Glaucium elegans is perhaps one of the most distinct of the forms in this troublesome genus where all the forms are somewhat variable and seem to pass one into the other. *G squamigerum*, on the other hand, is, so far as Afghan and Beluch specimens are concerned, most like *G. arabicum* Fresen. from Sinai, which in turn much resembles and is perhaps only a geographical form of *G. corniculatum*. As represented in Herb. Kew, Herb. Boissier and Herb. DC., *G. fimbrilligerum* Boiss. and *G. squamigerum* Kar. & Kir. would appear to be specifically separable but a fine suite of specimens from Turkestan in Herb. Paris shows that they pass into each other and that it is not possible to separate them even varietally.

6. (3.) CATHCARTIA Hook. f.

Key to the Indian species (incorporating the new forms).

* Stigma large, style very short; flowers large, stamens numerous (32); a softly hairy plant with (cordate lobed leaves and) rounded yellow petals ... 1. *C. villosa.*

* * Stigma small, style distinct, flowers small, stamens definite (16); glabrescent herbs with narrow pale-purple petals:—

† Leaves hastate-entire to lyrate-pinnatifid; petals ovate-lanceolate, obtuse, apex subfimbriate ... 2. *C. lyrata.*

† † Leaves ovate-lanceolate; petals lanceolate, acute, apex entire ... ... 3. *C. polygonoides.*

A purely E. Himalayan genus only separable from *Meconopsis* by the character of capsule dehiscing by valves from apex to base. As originally described the genus was supposed to have no style. There is however even in the original species a distinct, though short, style.

1. Cathcartia villosa *Hook. f. Bot. Mag.* t. 4596 (1851); *Flore des Serres* vii. t. 686 (1851); *Lemaire, Jard. Fleur.* ii. t. 167 (1852); *H. f. & T., Flor. Ind.* 254 (1855); *H. f., Ill. Him. Pl.* frontisp. (1855); *Walp. Ann.* iv. 175 (1857); *H. f. & T., Flor. Brit. Ind.* i. 119 (1872.)

This has been obtained in Eastern Nepal as well as in Sikkim by Dr. King's Calcutta collectors.

2. Cathcartia lyrata *Cummins & Prain*; glabrescent, rootstock slender clothed with sheaths; stem slender glabrous; radical leaves few early withering, cauline 3–4 from hastate-entire to lyrate-pinnatifid sparingly hirsute on both surfaces; flowers small, blue, solitary or in few-fld. cymes; style distinct; stigma small 2–3-lobed; seeds smooth without crests.

Sikkim Himalaya; 13–14000 feet, not common; Ta-ne-da *King!* Chiani, Phallut, and Jongri, *King's Collectors!* Tankra, *G. Gammie!* near Gnatong, *H. A. Cummins!*

Stem 3–10 in. simple or sparingly branched; *leaves* ½–1½ in. by ¼–¾ in., radical disappearing, cauline petioles ½–1½ in. *Flowers* 1–3 (usually solitary), *sepals* glabrous, buds ¼ in. diam. nodding; full blown flowers 1 in. diam.; pedicels very slender, petals narrowly to widely lanceolate rounded or obtuse rarely acute always fimbriate at the margin. *Stamens* 16, in 2 rows of 8 each; *placentas* 2–3, distinctly intruded. *Capsules* 1½ in. long, very slender, erect, valves membranous.

The complete elaboration of this interesting little species which has puzzled Indian botanists since 1877 when it was first obtained by Dr. King, is largely due to the efforts of Surgn.-Capt. Cummins of the Medl. Staff who met with it when stationed at Gnatong in 1893, and who has assisted the writer in preparing a description. The ripe fruits show that it is undoubtedly a *Cathcartia*; the valves dehisce to the base while the stigmatic rays are opposite the placentas. It differs however from the original *Cathcartia villosa* in having ripe seeds without a crested raphe, in having a distinct style, and a much smaller stigma. It must prove a welcome addition to western horticulture when its seeds are at length introduced to Europe.

3. CATHCARTIA POLYGONOIDES *Prain*; glabrescent, rootstock slender clothed with sheaths; stems slender strigose; radical leaf solitary persisting long-petioled, cauline leaves 2–3, lower long-petioled uppermost sessile clasping, ovate-oblong obtuse base cuneate, truncate or slightly cordate, margins entire or slightly incised crenate, sparingly hairy on both surfaces; flowers small bluish-white; style distinct, stigma small 2-3-lobed.

CHUMBI: Sham-chen, *Dungboo!* Put-lo and Ling-moo-tong, *King's Collectors!*

Stem 6–15 in. simple; *leaves* 1½–2 in. by ½–¾ in.; radical petioles 3 in., lower cauline petioles 1–4 in. long. *Flowers* solitary 1 in. diam. nodding, pedicels long slender; *petals* narrowly lanceolate apex acute margin entire; *stamens* 16 in 2 rows of 8 each; *placentas* 2–3.

The flowers and unripe capsules of this plant are so remarkably like those of *C. lyrata* that there would seem no room for doubt as to its generic position. But it is at the same time remarkably like a small form of a plant from Yunnan described by M. Franchet as *Meconopsis betonicaefolia* [*Plantae Delavayanae*, 42, t. 12 (1889)] of which it has all the habit and, though on a smaller scale, exactly the foliage. A final judgment on both *Cathcartia polygonoides* and *Meconopsis betonicaefolia* can therefore only be given when ripe fruit of both plants has been received. The *specific* differences between the two plants are the fewer (16) stamens in the Chumbi plant than in the Yunnan one, which has 64; the narrower much smaller petals; and the smaller ovary and stigma. As regards stigma *Meconopsis betonicaefolia* more nearly approaches *Cathcartia villosa*, but (like the two species now described) it has a long style; it has also more stamens (64 in 2 rows of 32 each in place of 32 in 2 rows of 16 each as in *C. villosa*). The ovary and unripe capsules of *Meconopsis betonicaefolia*, *Cathcartia lyrata* and *C. polygonoides* are remarkably similar; knowing that one of them *is* a *Cathcartia* the writer thinks it possible that the other two may eventually prove to be members of the same genus.

7. (4.) CHELIDONIUM TOURNEF.

Perennial glaucous herbs with yellow juice. Radical leaves petioled few erect or many rosulate, cauline few scattered, or 0, floral 0, or 2 terminal subopposed, or several near apex scattered. Flowers in fascicled or corymbose cymes. Sepals 2, petals 4, yellow or orange, convolute, stamens numerous, ovaries linear rarely ovate, 2-(rarely 3–4)-valved; style distinct stigma 2-lamellate lobes erect alternate with placentas, sinuses not projecting into arms. Capsule slender cylindric, rarely ovate, valves dehiscing throughout their length. Seeds shining smooth or opaque pitted, not scrobiculate, raphe crested. Species 9; 7 Chinese, of which 1 (*C. japonicum*) extends to Japan, another (*C. majus*) occurs also in Japan, Mongolia and Dahuria, extends westward to Britain and is naturalised in N. America; 1 North American; 1 Himalayan.

In the *Flora Indica* (1855) Sir J. D. Hooker and Dr. Thomson founded a genus *Dicranostigma* on the Indian species here dealt with. This species (*Dicranostigma lactucoides*) was however subsequently referred to *Stylophorum* by Mr. Bentham and Sir J. D. Hooker [*Gen. Pl.* i. 53 (1862)], by M. Baillon [*Hist.* iii. 114 (1871)] and again by Sir J. D. Hooker and Dr. Thomson [*Flor. Brit. Ind.* i. 119 (1872)]. More recently Messrs. Prantl and Kundig have suggested [*Engler, Natür. Pflanzenf.* iii. i. 139 (1891)] that *Dicranostigma* should rather be referred to *Hylomecon* Maxim. [*Prim. Fl. Amur.* 36, t. 3 (1858)] a genus founded on a plant that was originally [*Thunbg. Flor. Japon.* 221 (1784); *Sieb. & Zucc. Abh. Acad. Muench.* iv. ii. 169 (1846)] referred to *Chelidonium*, but that was at a later date [*Miquel, Prolus. Flor. Japon.* 199 (1867)] included in *Stylophorum*; this genus Mr. Prantl would reinstate. The view expressed by Prantl and Kundig is undoubtedly more tenable than that of the other authors quoted; at the same time if the method of limitation adopted by them be accepted it would be more advisable to retain *Dicranostigma* also as a genus. In any case the name of the conjoint genus suggested by Prantl and Kundig must be *Dicranostigma*, not *Hylomecon*. But the species in question, formerly very inadequately known, has been recently communicated by Mr. Duthie from Kamaon (its original locality) and by the collectors of the Calcutta garden from Phari in the Eastern Himalaya. A study of these specimens and of the material of the allied groups *Stylophorum* and *Hylomecon*, preserved in the national Herbaria at Kew and at the Jardin des Plantes, Paris, shows however that it is impossible to accord generic rank to any of them, or to separate them satisfactorily from each other or from *Chelidonium*. A detailed review of the species belonging to this widened *Chelidonium* will be found in the *Bulletin* of the Boissier Herbarium.

1. CHELIDONIUM DICRANOSTIGMA *Prain*. Dicranostigma lactucoides *H. f. & T. Flor. Ind.* 255 (1855); *Walp. Ann.* iv. 272 (1857). Stylophorum lactucoides *Baill. Hist. Pl.* iii. 114 (1871); *H. f. & T. Flor. Brit. Ind.* i. 119 (1872).

N.-W. HIMALAYA: Kamaon, *Strachey and Winterbottom* n. 3! *Duthie* nn. 2699! 3819! 5326! EASTN. HIMALAYA: Phari, *King's Collector!*

Nearly allied to *Chelidonium Franchetianum* Prain [in *Bull. Herb. Boiss.* ined.] and *C. leptopodum* Prain [Glaucium leptopodum *Maxim. Mel. Biol.* ix. 714 (1876)], which belong equally to the section *Dicranostigma*. From both it differs in having large stigmatic lobes, softly hairy capsules, and simple cymes. The section to which these species belong differs from the remaining *Chelidonia* is having a glaucioid habit—*i. e*, radical leaves many rosulate, cauline 0, floral apical all scattered.

On a new species of RENANTHERA.—*By* G. KING *and* D. PRAIN, *Royal Botanic Garden, Calcutta.*

[Read July, 3rd.]

Some years ago Lieutenant E. J. Lugard sent to the Calcutta Herbarium, for identification, some dried flowers and a living plant of what was evidently a species of *Renanthera*. The living plant unfortunately soon died in the uncongenial climate of Calcutta; the dried flowers were, however, sufficient to show that the plant probably belonged to a species near *R. coccinea*, Lour. Last year Lieutenant J. B. Chatterton was kind enough to send several plants of the same orchid to the Calcutta Garden, which were promptly transferred to the more suitable climate of the Cinchona Plantation in Sikkim. These plants flowered a few weeks ago and there is now no doubt that they belong to an undescribed species which from the resemblance of its flowers to the extended wings of a brilliantly coloured butterfly we now name *R. Papilio*. For a description of the flowers, drawn up from living specimens, we are indebted to Mr. R. Pantling, of the Cinchona Plantation, who has also made a beautiful coloured drawing of the plant.

RENANTHERA PAPILIO, n. sp. King and Prain. *Leaves* loriform, 2 to 2·5 in. long and about ·5 in. broad; their apices blunt and unequally lobed. *Inflorescence* 9 to 10 inches long, laxly racemose, or rarely panicled, on stalks of about equal length or longer, the bracts small, the stalked ovary about 1 in. long. *Dorsal sepal* linear-oblong, contracted below the blunt sub-cucullate apex, ·75 in. long. *Lateral sepals* twice as long as the dorsal, narrowly elliptic, flat, with undulate edges, the inner margins touching above the slender twisted claws; the apices sub-acute and divergent. *Lateral petals* ·5 in. long, spathulate, slightly incurved. *Lip* with acuminate-side lobes each with a small rounded basal auricle, the middle lobe broadly ovate, concave, its apex acute and pointing forwards, the base auricled. *Spur* short and blunt, with two erect toothed divergent plates near its mouth. *Column* minutely ciliate behind the anther; *stigma* with a thin deflected transparent lip.

ASSAM.

The colour of the flowers is a brilliant scarlet with a tinge of lake. The toothed plates of the spur end abruptly at the base of the middle lobe of the lip and immediately in front of their termination there are three blunt tooth-like processes. In its habit and the colour of its flowers the species resembles *R. coccinea*, Lour., but the flowers are larger and the lobing of the lip and the shape of the lateral sepals are very different.

On some New Orchids from Sikkim.—*By* G. KING *and* R. PANTLING.

The publication, in Sir Joseph Hooker's *Flora of British India*, of his account of the Orchids of the Empire marks an era in the study of this most interesting Natural Family. Prior to the issue of Sir Joseph's account of the group, it was extremely difficult to identify any Indian orchid that did not happen to have had a figure of itself published in some horticultural or botanical work. *Now* the work of determining the name of a species has been made comparatively easy; and the facilities which have thus been provided have stimulated local research. In the present paper we offer to the Society descriptions of thirty-three new species—twenty belonging to the Tribe *Epidendreæ*, eight to the Tribe *Vandeæ*, three to the *Neottieæ*, two to the *Ophrydeæ*—which have been discovered in Sikkim within the past few years.

Epidendreæ.

MICROSTYLIS, Nutt.

MICROSTYLIS MAXIMOWICZIANA, n. spec. *Rhizome* 2 to 4 in. long, with scattered root fibres and bearing a leafy pseudo-bulb 3 or 4 in. long. *Leaves* 4 or 5, elliptic to elliptic-lanceolate, acute, tapering to the sheathing base, slightly oblique, 5 to 6 in. long. *Raceme* about 6 in long with numerous green flowers nearly ·2 in. in diam., the stalk of the raceme 4 to 5 in. long. *Floral bracts* linear-lanceolate, equal to or exceeding the stalked ovary. *Sepals* oblong, blunt, their margins recurved, the lateral broader than the dorsal. *Petals* linear, all reflexed, the lip hood-shaped; its apex contracted, thickened and slightly crenate, and with two minute teeth above the pit; the side lobes subfalcate, blunt. *Arms* of the *column* broad, overlapping and hiding the anther, the stigma occupying the whole face of the column. *Lip* of anther truncate.

Sikkim: On the Mungpoo Cinchona Plantation, alt. 2,000 to 4,000 feet; flowers in July.

The species is self-fertile.

OBERONIA, Lindl.

OBERONIA FALCATA, n. spec. *Stems* caulescent, tufted, 3 in. long. *Leaves* falcate, acute 1 to 2 in. long, and ·25 in. broad. *Racemes* almost sessile, erect, 2 to 3 in. long; the flowers yellowish-green, minute, very numerous and sub-verticillate. *Flower-bract* ovate, erose, equal to and sheathing the stalked ovary. *Sepals* broadly ovate, entire, reflexed. *Petals* linear-oblong, blunt, entire. *Lip* twice as long as the sepals, broadly oblong, flat except for a slight depression below the column; the side lobes short, subulate, spreading; the apex deeply bifid, the lobes oblong-acute, slightly divergent at their apices. *Column* with two fleshy wings. *Anther* membranous; the pollinia ovate, flattened and of a dark orange colour.

Sikkim: at Labha, elevation about 6,000 feet? In flower in July. (Both locality and elevation are however doubtful).

This belongs to same group as *O. caulescens*, Lindl. and *O. Wightiana*, Lindl.

OBERONIA LONGILABRIS, n. spec. *Stems* caulescent, slightly tufted, erect, slender, 2 to 3 in. long. *Leaves* narrowly ensiform, acute, 1 to 1·5 in. long, and ·2 in. broad. *Racemes* slender, 2·5 to 3·5 in. long, nodding; their stalks ·5 to 1·25 in., ebracteate. *Flowers* minute, rather sparse, green. *Bract* lanceolate, erose, much exceeding the stalked ovary. *Sepals* ovate, entire. *Petals* linear, blunt. *Lip* oblong, three times as long as the sepals, with two small rounded lobes at the very base, the apical lobes broadly lanceolate, sub-divergent, acute, the sinus apiculate, the surface of the lip with a lanceolate depression extending from near the sinus to the column and there becoming deeper. *Column* with small stout wings. *Pollinia* orange.

Sikkim: at Songchongloo, elevation 6,000 feet; in flower in July.

A species near *O. caulescens*, Lindl.

OBERONIA MICRANTHA, n. spec. Acaulescent, height of whole plant 2·5 inches. *Leaves* narrowly-ensiform, sub-acute, ·5 to 1·5 in. long, and from ·1 to ·15 in. broad. *Racemes* about 1·25 in. long, on very short bracteate stalks. *Flowers* numerous, very minute, verticillate. *Bracts* linear-lanceolate, erose, equal to or slightly exceeding the ovary. *Sepals* broadly ovate, entire, spreading, minutely papillose externally. *Petals* narrower than the sepals, ovate, entire, recurved. *Lip* in general outline sub-rotund divided into a basal and apical part by deep lateral sinuses: the basal part concave, fleshy, its edges almost entire; the apical part transversely elliptic, thinner than the basal, with an acute apiculus and irregularly erose-dentate edges.

Sikkim: at Tendong, elevation 6,000 feet; in flower in July.

The nearest allies of this very distinct little species are *O. myriantha*, Lindl. and *O. demissa*, Lindl.

OBERONIA PARVULA, n. spec. Acaulescent, not tufted or very slightly so: the height of the whole plant 1·25 to 2 in. *Leaves* two or three, ·5 to nearly 1 in. long, and ·12 to ·25 in. broad, lanceolate, acute. *Raceme* ·75 to 1 in. long, on a slender stalk about half as long. *Flowers* very minute, densely crowded, not verticillate. *Bract* lanceolate, as long as the stalked ovary. *Sepals* ovate, entire, the laterals larger and wider-spreading than the dorsal, and keeled. *Petals* linear, truncate, shorter than the sepals, entire, pale yellow and transparent like the sepals. *Lip* reddish brown, with broad reniform base having a lateral sinus and a short convergent horn at each side at its anterior end: the apical lobe broadly oblong, deeply bifid, the lobes lanceolate and slightly convergent, and the sinus narrow, not triangular and with a concave emarginate apex. *Stigma* concave.

Bhotan: at Guru-bathan, at an elevation of about 1,500 feet; in flower in February.

A very distinct species.

OBERONIA LOBULATA, n. spec. Acaulescent, not tufted. *Leaves* about four, large, oblong, sub-acute, 1·25 to 3 in. long, and ·4 to ·5 in. broad. *Raceme* 4 in. long, on a winged ebracteate peduncle about half as long, much decurved. *Flowers* distant, minute, green. *Bracts* broadly oblong, the apex convex and minutely erose equalling and sheathing the sessile ovary. *Sepals* ovate, acute, entire, reflexed; the *petals* similar but narrower. *Lip* broadly triangular with irregularly erose margins, the apex with a broad shallow sinus and two short blunt lobes. *Stigma* convex ?

Sikkim: in the valley of the Teesta, at an elevation of about 1,000 feet; in flower in October.

Collected only once. A remarkable species with the pollinia encased within the anther cells and not free as is usually the case in the genus *Oberonia.*

OBERONIA PRAINIANA, n. spec. Acaulescent, and slightly tufted *Leaves* very fleshy, falcate, sub-acute, ·5 to ·75 in. long, and ·25 in broad. *Raceme* slender, many times longer than the leaves, erect, 4 in. long: stalk of the raceme attached to the uppermost leaf, minutely bracteolate, filiform, about 1 in. long. *Flowers* of a warm brown colour, verticillate, very minute. *Bract* oblong, sub-entire, equal to and embracing the stout sessile ovary. *Sepals* oblong, blunt, all much revolute. *Petals* elliptic-lanceolate, spreading, deeply serrate. *Lip* triangular-oblong with a circular nectar-bearing pit near its base and under the column, the apex blunt, the margins deeply erose-dentate. *Pollinia* 2 pairs, orange-coloured.

Sikkim: in the Teesta Valley, at an elevation of about 1,000 feet; in flower in July.

A very distinct species remarkable or the great length of the slender inflorescence in proportion to the leaves, and for its unlobed but deeply erose dentate lip.

DENDROBIUM, Swartz.

DENDROBIUM COESPITOSUM, n. spec. Pseudo-bulbs tufted, narrowly conical, from ·5 to 1 in. long. *Leaves* linear-oblong; the apex sub-obtuse, minutely and obliquely emarginate, about 1·5 in. long and ·25 in. broad. *Racemes* terminal 1 to 2 in. long, the rachis slender, minutely bracteolate, 8- to 12-flowered. *Sepals* and *petals* sub-equal, narrowly lanceolate acute, ·25 in. long, slightly spreading. *Lip* slightly shorter, fleshy obovate-oblong, decurved at the base, otherwise flat, without lateral lobes, the margins ciliolate near the base; disc much thickened and deeply 3-grooved; mentum concave. *Anther* papillose; *pollinia* thin.

Sikkim: in the Naru Valley, at an elevation of 6,000 feet; in flower in June.

This species belongs to the group *Stachyobium* and is allied to *D. alpestre*, Royle, but that species has a lip with incised-serrate lateral lobes, a small crisped terminal lobe, and a central bi-lamellate disc. It is also allied, but not so closely, to *D. eriæflorum*, Griff.

DENDROBIUM PAUCIFLORUM, n. spec. Stems 2 to 3 feet long, as thick as a goose-quill, branching, and tapering towards each extremity, pendulous, smooth when young but slightly grooved when old. *Leaves* linear-lanceolate, obliquely and minutely emarginate at the apex 3 to 4 in. long, and ·5 to ·75 in. broad. *Racemes* lateral about ·5 in. long, 1–4-flowered; flower-bract ovate, blunt ·1 in. long. *Flowers* ·75 in. long. Lateral *sepals* ovate; the dorsal narrower, blunt. *Petals* ovate-lanceolate, ciliolate. *Lip* ·5 in. long, oblong, clawed: basal lobes narrow, directed forwards, fringed, the part between these lobes much thickened and bearing on its surface 3 raised lines; terminal lobe flat, hispid with no central thickening or lines; *mentum* with a large nectar-secreting chamber, its upper (posterior) portion partially covered by the wings from the sides of the column.

Sikkim above Engo, at an elevation of about 4,000 feet; in flower in June.

The flowers are of a golden yellow colour, the sepals and petals being broadly margined with crimson. The apical lobe of the lip is spotted with red. Its nearest ally is probably *D. sphegidoglossum*, Reichb. fil. The position of the basal lobes of the lip is so far forward that they are really not basal but lateral.

BULBOPHYLLUM, Thouars.

BULBOPHYLLUM CORNU-CERVI, n. spec. Pseudo-bulbs globular, touching, only ·1 in. in diam. *Leaf* coriaceous, sub-sessile elliptic or elliptic-rotund tapering slightly to the base, 1 to 1·5 in. long and ·6 to ·8 in. broad. *Raceme* 1·4 to 1·75 in. long, on a sub-erect stalk rather longer and stouter than itself and bearing at intervals a few minute bracteoles. *Flowers* rather distant, about ·25 in. long. Dorsal *sepal* oblong, blunt, lying parallel to the column; the laterals broader, flat, with involute margins. *Petals* half as long as the sepals, lanceolate, 1-nerved (in fresh flowers). *Lip* fleshy, sub-rotund with lateral sinuses; the basal portion thick concave; the anterior portion thinner and much deflexed so that its upper surface is convex, the edges entire. *Column* very short, with stout 2–3-fid arms variable in shape; *mentum* flat, narrowing outwards, with a stout raised mesial line which begins as a hook at the lower margin of the stigma. *Anther* flat; *pollinia* small.

Sikkim: near the base of the Engo ridge at an elevation of probably about 2,500 feet: flowering in July.

The sepals of this are green with reddish-brown margins; the lip is yellow with a touch of dull red at the base. The nearest ally of this seems to be *D. alcicorne*, Par. & Reichb. fil.

Bulbophyllum Clarkeanum, n. spec. *Rhizome* long, about the thickness of a crow-quill, sending up at intervals of about an inch and a half, ovoid-globose obtuse pseudo-bulbs ·35 to ·6 in. long. *Leaf* narrowly elliptic, slightly notched at the apex, sessile, about 1 in. long and ·5 in. broad. *Scape* ·5 to 1 in. long, slender, with 3 to 5 small sheaths 2–3-flowered. *Flowers* ·3 in. long, their pedicels ·2 in. long, borne at the apex of the scape. *Sepals* sub-equal, lanceolate-acuminate, their apices thickened. *Petals* about one-third of the length of the sepals, broadly ovate, obtuse, 3-nerved. *Lip* ovate, acute, decurved, the upper surface convex with an elongated central pit; the edges thin erose. *Column* with long projecting spurs.

Western Dooar of Bhotan; in the Kumai Forest near the Jaldacca River, at an elevation of about 1,500 feet: flowering in June.

This is allied to *B. stenobulbon*, Par. & Reichb. fil., but has different pseudo-bulbs and leaves.

Bulbophyllum cylindricum, n. spec. *Rhizome* long, creeping, ·1 in. thick, with numerous sheaths towards the apex, bearing at distances of about two inches cylindric pseudo-bulbs truncate at the apex and 1 to 1·25 in. long. *Leaf* narrowly oblong, sessile, blunt, faintly notched at the apex, 2·5 to 3 in. long, and ·4 to ·5 in. broad. *Scape* about as long as the pseudo-bulb, slender, minutely bracteolate. *Flowers* 3 to 5, sub-umbellate, about ·25 in. long. *Sepals* lanceolate, caudate-accuminate, the dorsal shorter than the laterals. *Petals* about one-fourth of the length of the lateral sepals, ovate, sub-acute, 1-nerved. *Lip* oval, blunt, flat, its margins thin, entire, much reflexed. *Column* very stout, with short spurs; *mentum* conical. *Anther* with a raised fleshy mid-area, its lip truncate; *pollinia* divergent.

Sikkim: Mungpoo, at an elevation of about 3,000 feet: flowering in June.

This is also closely allied to *B. stenobulbon*, Par. & Reichb. fil. of which it has the leaves and pseudo-bulbs, but the flowers are different. It is likewise allied to *B. Clarkeanum*.

Bulbophyllum ebulbum, n. spec. *Rhizome* ·15 in. thick, smooth, bearing leaves at distances of three or four inches. *Pseudo-bulbs* none. *Leaves* with long petioles, the blades oblong-lanceolate, tapering to base and apex, about 7 in. in length and 1 to 1·25 in. broad: *petiole* 1·5 to 2 in., channelled. *Raceme* erect, rising immediately in front of a leaf, many-flowered, about 3 in. long, its stalk about half as long, bracteate. *Flowers* rather distant, ·25 in. long. *Sepals* lanceolate, acuminate, (1-nerved ?), the dorsal shorter. *Petals* linear-lanceolate, 1-nerved, half as long as the lateral sepals. *Lip* oblong, stipitate, deflexed from the middle, blunt, entire, longer than the lateral petals. *Column* stout, with mentum twice as long as itself and bearing a large swelling below the stigma. *Anther* thickened down the centre, entire.

Sikkim: at Sivoke, elevation 1,000 feet; in flower in July.

The nearest ally of this is undoubtedly *B. apodum*, Hook, fil. from which it is however well separated by the shape of the leaf, and the non-auriculate lip.

Bulbophyllum Listeri, n. spec. Pseudo-bulbs oblong-ovate, compressed, ·35 in. long, arranged alternately and close together on a thread-like rhizome. *Leaf* fleshy, linear-oblong; sub-acute, sessile, 1 to 1·5 in. long. *Flowers* ·125 in. long, solitary from the bases of both old and new pseudo-bulbs, and much shorter than the latter, the shortly-stalked ovary enveloped by several shrivelled bracts. Dorsal *sepal* ovate-lanceolate, blunt; the laterals a little longer, cohering by their lower margins nearly to the tips and forming a kind of trough in which the lip lies, their margins ciliolate. *Petals* fleshy, ovate, erose at the apex, minutely ciliolate in the middle. *Lip* lanceolate almost flat, the apex alone slightly decurved, the base constricted into a short claw, the upper surface with a thickened yellow mesial line. *Column* very short, its spurs long, slender, up-curved. The galeate *anther* with a filiform attachment to the column.

British Bhotan: at the Rumpti Lake, elevation 1,000 feet: flowering in March.

This remarkable species was discovered by Mr. J. L. Lister, of the Bhotan Cinchona Association, who gave it to Mr. Pantling. It is one of the most curious in the whole genus. The flowers are of a dull lake.

CIRRHOPETALUM, Lindl.

CIRRHOPETALUM DYERIANUM, n. spec. *Rhizome* ·1 inch thick. *Pseudobulbs* ovoid-globose, ·35 to ·5 in. long, touching or from ·25 to ·5 in. apart. *Leaf* fleshy, elliptic, blunt, sessile. *Scape* 2·5 in. long. filiform, pendulous, bracteolate only at the base, bearing 3 or 4 rather distant racemose flowers ·65 in. long, each with a lanceolate acuminate basal bract equally the slenderly pedicelled ovary. Dorsal *sepal* ovate, acute, the laterals two and a half times as long, linear-oblong, acuminate, slightly oblique, and somewhat incurved at their apices but not cohering. *Petals* equal to the dorsal sepal in length, ovate, acute, erose. *Lip* narrowly triangular with a deep mesial groove to near the apex. *Column* with short up-curved spurs; *mentum* twice as long as the column. *Anther* minutely papillose.

Sikkim: or the summit of Tendong, elevation 7,000 feet; in. flower in August.

CIRRHOPETALUM SARCOPHYLLUM, n. spec. *Rhizome* ·15 in. thick, bearing at intervals of 3 or 4 inches small flat disc-like pseudo-bulbs, ·35 in. in diam. *Leaf* 4 to 9 in. long, pendulous, very coriaceous, oblong-lanceolate, sub-falcate, without visible nerves, contracted at the base to a thick cylindric petiole ·75 to 1 in. long. *Scape* 3 or 4 in. long, pendulous, with a few equidistant ovate-lanceolate acute sheathing bracts ·25 in. long and bearing at its apex an umbel of 3 to 7 shortly stalked flowers ·75 in. long. Dorsal *sepal* ovate-acuminate ·35 in. long, the laterals narrower, and twice as long, cohering for one-third of their length, free at the tips, glandular-puberulous. *Petals* oblong, falcate, acute ·2 in. long. *Lip* tongue-shaped, channelled below. *Column* with slender divergent spurs with a smaller tooth at the base of each: *mentum* stout with two parallel central raised lines. *Lip* of *anther* recurved. *Pollinia* cuneate.

Sikkim: at Rishap, elevation about 2,500 feet; in flower in September.

The flowers are purplish speckled with yellow.

CHRYSOGLOSSUM, Blume.

CHRYSOGLOSSUM MACROPHYLLUM, n. spec. *Pseudo-bulb* sub-cylindric, thin, 6 in. long. *Leaf* plaited, oval, slightly narrowed at base and apex, 15 in. long and 7 in. broad: its petiole 8 in. long. *Raceme* about 6 in. long, many-flowered, its stalk about 12 in. long, sparsely bracteolate: *Flowers* ·5 in. across, their ovaries ·5 in. long, bracts lanceolate, reflexed, shorter than the ovaries. *Sepals* sub-equal, the dorsal lanceolate, the laterals falcate. *Petals* slightly broader than the sepals, falcate. *Lip* contracted into a claw at the base, mobile, oblong, abruptly decurved from the rounded basal lobes, the apex minutely emarginate and decurved: upper surface with two bold longitudinal minutely hispid lamellae running from the base to nearly the apex where they unite. *Mentum* half as long as the entire column. *Anther* with two projecting triangular wings. *Pollinia* 2, attached to a small viscid disc.

Sikkim: in the Chel valley, at an elevation of 4,000 feet; in flower in May.

This differs from any *Chrysoglossum* known to us in having a wingless column. The flowers have an unpleasant smell.

ERIA, Lindl.

Eria fibuliformis, n. spec. *Pseudo-bulbs* crowded and often overlapping, much depressed, reticulate, ·5 in. in diam. *Leaves* membranous, in pairs, oblanceolate, sub-acute, sessile, the edges minutely ciliolate, 1·75 in. long. *Flowers* in pairs, ·25 in. long, their ovaries short, sigmoid, sub-campanulate. *Sepals* united to form a 2-lipped beaked sac, gibbous at the base. *Petals* oblong-lanceolate, sub-acute, obliquely curved, not quite so long as the calyx, their apices connivent above the very small lip, (1-nerved ?). *Lip* half as long as the petals, clawed at the base, its upper surface concave, the side lobes broad and rounded, the part beyond them contracted and with laciniate edges, the apex caruncnlate, a small retrose callus in front of the basal claw. *Mentum* twice as long as the column, tapering downwards. *Rostellum* very large and resting on the two lobes and upper margin of the stigma. *Anther* crested and tuberculate, its lip erose. *Pollinia* 8, barely cohering by their minute membranes.

Sikkim: in tropical valleys at the base of the hills, at Sivoke, &c.: in flower in October.

This belongs to the section *Porpax* and is allied to *E. Lichenora*, Lindl. and *E. ustulata*, Par. & Reichb. fil. Its sepals are united to form a curious 2-lipped sac, sparsely hispid externally. All parts of the flower are of a uniform dull red colour.

TAINIA, Blume.

Tainia Hookeriana, n. spec. *Pseudo-bulbs* ovoid, tapering upwards, 2 to 3 in. long, rising close together from a stout rhizome, and enveloped in a bract which sheaths also the petiole nearly to its apex. *Leaf* plicate, oblong-lanceolate, tapering much to each end, 12 to 18 in. long and about 3 in. broad, its petiole somewhat shorter. *Raceme* about 10 in. long, its stalk about twice as long, glaucous, bearing two or three sheathing bracts near the base: floral bracts lanceolate, ·25 in. long. Flowers about 1 in. long, their ovaries ·75 in. *Sepals* and *petals* sub-equal, lanceolate, accuminate. *Lip* oblong with rather large blunt incurved side-lobes and a dilated sub-reniform apex apiculate in the centre; upper surface of the middle of the lip with 3 ridges which, beginning at the base as lines, pass into converging lamellae towards the apex; spur blunt, incurved, exceeding the sepals by ·12 in. *Column* winged. *Anther* with two bosses.

Sikkim; in the valley of the Teesta at an elevation of 1,000 feet; in flower in March.

The colour of the sepals and petals is greenish with brown lines: the lip is white, and its lamellae are yellow spotted with pink. The anther is pink and its bosses are dark red. The species is near to *T. viridifusca*. We have dedicated it to Sir Joseph Hooker.

CALANTHE, R. Br.

CALANTHE TRULLIFORMIS, n. spec. *Leaves* linear-lanceolate, acute, sessile, 9 to 12 in. long. *Raceme* about 9 in. long; its stalk about the same length, puberulous. *Flowers* 14 to 18, scattered, about 1 in. in diam.; floral bracts linear-lanceolate equal to or exceeding the stalked puberulous ovaries. Dorsal *sepal* ovate-lanceolate, narrowly acuminate ·75 in. long; lateral *sepals* lanceolate, falcate, longer than the dorsal. *Petals* linear, acute, shorter than the lateral sepals. *Lip* sessile, trowel-shaped, the base entire, the sides irregularly crenate-dentate, not lobed; the apex acuminate, entire: the upper surface with two converging lamellæ extending from its base midway to the apex: *spur* short, stout; its mouth triangular, its interior bristly. *Pollinia* in 4 clavate unequal pairs.

Sikkim: on Mahaldaram Peak: elevation 6,000 feet; flowering in in July.

A species allied to *C. puberula*, Lindl. but differing from that species in having sessile leaves and a lip without side lobes. The colour of the sepals and petals is brown with a mesial and marginal green lines. The lip is white, with a triangular pink mark at the base.

Vandeæ.

EULOPHIA, R. Br.

EULOPHIA GENICULATA, n. spec. *Leaves* about three and a half feet in length of which the petiole forms one-third, the blade linear-lanceolate, acute, plicate. Flowering *scape* about 18 in. long, clothed throughout with sheathing bracts 1 to 3 in. long, and bearing at its apex a 6- to 8-flowered raceme. *Flowers* 1 in. in diam., each with a lanceolate acute bract equalling the sub-sessile, cylindric ovary. Dorsal *sepal* elliptic, blunt: the two lateral elliptic-lanceolate, sub-acute.

Petals oblong, blunt, shorter than the sepals, connivent over the column. *Lip* oblong, with long shallow side-lobes, its body as far as the end of the side lobes with three to five parallel thickened nerves which end beyond the extremities of the side-lobes in a carunculate area on the truncate apical lobe: spur geniculate, short. *Anther* with a small 2-lobed lip.

Sikkim: in the valley of the Teesta: elevation about 1,000 feet: flowering in August.

The sepals of this are brown, the petals and lip pale yellow. The petioles of the two leaves form a pseudo-stem rather shorter than the scape, and they are enclosed within two sheaths about 9 inches long. This pseudo-stem is bound to the scape near its base by two short broad sheaths which originate from the tuber. The nearest ally of the species is *E. lachnocheila*, Hook. fil.

CYMBIDIUM, Swartz.

CYMBIDIUM MUNRONIANUM, n. spec. Terrestrial. *Leaves* stiff, erect, ensiform, 16 to 20 in. long and ·75 in. broad, tapered into a petiole or not. *Racemes* stout, erect, about one foot long, about half being stalk, with two or three distant closely embracing sheaths 1 in. long. *Flowers* about 7 or 8, distant, 1 in. in diam., their bracts ·25 to ·35 in. long, lanceolate. *Sepals* and *petals* sub-equal, oblong-lanceolate, acute. *Lip* lanceolate (when flattened out), everywhere concave on the upper surface; the lateral lobes elongate and shallow, the body with two parallel smooth lamellæ in its centre ending with the side-lobes, the apical lobe narrow and reflexed. *Pollinia* 4, plano-convex, the gland narrow.

Sikkim: in the Teesta Valley on dry knolls: at an elevation of 1,500 feet: flowering in May.

The flowers of this species are sweetly-scented: the sepals and petals are straw-coloured and each has 5 dotted or streaked lines: the lip is white except its apical lobe, which is pale yellow transversely blotched with red. Its nearest ally is *C. ensifolium*, Swartz, under which it appears to be included by Lindley and other authorities. This Sikkim plant appears to us to differ very materially from the true Chinese *C. ensifolium*. We have dedicated the species to the late Mr. James Munro, for many years resident in Sikkim, and well-known, not only as a lover of plants, but as a man of great sincerity, and of unlimited kindness and hospitality.

CYMBIDIUM SIMONSIANUM, n. spec. *Leaves* linear, sessile, the apex acute and sub-oblique: length 3 feet or more: breadth ·4 in. *Raceme* 8 in. long, pendulous, shortly stalked, sheathed at the base by large imbricate bracts 1 to 2·5 in. long. *Flowers* about 10 to 12, sparse, their bracteoles very short. *Sepals* sub-equal, linear, slightly wider near the apex, about 1 in. long. *Petals* rather shorter than the sepals, connivent round the column. *Lip* with long shallow erect blunt entire side-lobes parallel with, and as long as, the column; the apical lobe ovate, apiculate, deflexed; lamellæ of the lip 2, stout, parallel, clothed with glandular hairs, ending abruptly with the basal lobes but continued partly into the apical lobe as thickened lines. *Pollinia* falcately ovoid, compressed; the gland large.

Sikkim: in the valley of the Teesta: elevation about 1,000 feet. Assam: locality unknown; flowers in August.

The flowers of this species are sweet-scented: the sepals and petals are white with a crimson central line; the lip is also white, but has oblique crimson lines on the lateral lobes, with large blotches of the same colour on the apical lobe: the column is of a very dark crimson, and the anther of a pale yellow colour. Specimens of this plant were sent many years ago from Assam by the late Dr. J. C. Simons, to whom the Calcutta Herbarium is indebted for numerous contributions of plants, and for a large number of drawings of orchids. The species is now dedicated to his memory.

CYMBIDIUM GAMMIEANUM, n. spec. *Leaves* linear, slightly narrowed to the base, the apex acute, 2 to 3 feet long and about ·75 in. broad. *Raceme* pendulous, about 12 in. long with a stalk about three-fourths as long, laxly or densely-flowered, the bracteoles minute, the stalk enveloped in large imbricate sheaths 3 to 4 in. long. *Sepals* linear-lanceolate or linear-oblanceolate, 7-nerved, 1·5 to 1·75 in. long and about ·45 in. broad. *Petals* linear-oblong, sub-falcate, slightly shorter than the sepals, 7-nerved. *Lip* about as long as the sepals, oblong, the side lobes shallow, elongate, acute, the apical lobe sub-orbicular undulate, puberulous, separated from the lateral lobes by a sinus; lamellæ of the lip 2, pubescent, parallel, but meeting and ending abruptly with the side lobes opposite the ciliolate sinus. *Column* slender, slightly winged. *Capsule* 2 in. long.

Sikkim: at elevations of from 5,000 to 7,000 feet: flowering in September and October.

The colour of the flowers in this species is a dirty yellow: the lip is of a brighter yellow and has brown lines on its side lobes. Individuals with flowers of a paler yellow are however very common, and these have usually densely-flowered racemes like *C. elegans*, Blume; while the plants with dirty yellow flowers have lax racemes suggestive of those of *C. longifolium*, Don. This species, although common in Sikkim; has hitherto remained un-named. We dedicate it to Mr.

J. A. Gammie, Deputy Superintendent of the Government Cinchona Plantation in Sikkim, whose work in the cultivation of the medicinal species of *Cinchona* and in the local manufacture of Quinine is so well-known and so highly appreciated. The species is allied to *C. Mastersii*, Benth. and *C. affine*, Warn.

SARCOCHILUS, R. Br.

Sarcochilus retro-spiculatus, n. spec. Leafless; the roots large, numerous and flat. *Scape* about ·75 in. long, bearing at its apex 1 or 2 green, minutely bracteolate flowers ·2 in. long. *Sepals* and *petals* sub-equal, linear-lanceolate, wide-spreading, the laterals inserted on the sides of the lip. *Lip* sessile, linear-lanceolate, the apex with a retrorse tooth; the base sub-gibbous, side lobes none: the spur globose, its mouth contracted. *Column* very short. *Pollinia* 4: the caudicle short, dilated below the pollinia, the gland ovate.

Sikkim: at elevations of about 5,000 feet; flowering in June.

A very inconspicuous species, remarkable for the curious retroflexed apical spicule-like appendage of the lip.

Sarcochilus crepidiformis, n. spec. A minute leafless plant with comparatively large spreading roots. *Raceme* erect, ·35 in. long, flowers ·15 in. long, bracteate, distichous, opening singly. *Sepals* sub-equal, ovate, blunt. *Petals* shorter than the sepals, lanceolate. *Lip* sessile on the column, forming a roundish cup with entire edges, about equalling the dilated horizontal spur which is pilose just inside its mouth. *Column* very short. *Anther* thin, with a slightly deflexed fleshy lip. *Pollinia* 4, all attached to a single thread-like caudicle: gland ovate. *Ovary* long, sub-sessile: *fruit* 1 in. long, cylindric.

Sikkim: in tropical valleys: flowering in September.

The sepals and petals of this curious little plant are greenish, the lip is white, and the stigma has purple margins. It is named from the resemblance of the combined lip and spur to a slipper or last.

Sarcochilus bimaculatus, n. spec. *Stem* very short. *Leaves* linear-oblong, narrowed to the base, sub-falcate, the apex obliquely bifid, 2 in. long, and 35 in. broad. *Raceme* stout, ·75 in. long, compressed, and with persistent triangular bracts. *Flowers* confined to the upper half of the rachis, distichous, ·3 in. in diam., sessile. *Sepals* sub-equal, ovate-lanceolate, apiculate, the laterals attached to the base of the column. *Petals* shorter than the sepals, ovate, sub-acute. *Lip* springing at right angles from a short mentum, and lying parallel to the column; its side lobes narrow, elongate, falcate, acute at the apex: apical lobe triangular, very fleshy and with two flat calli at its base where the side lobes end: the centre of the body of the lip with larger elongate calli near its union with the mentum. *Stigma* large. *Rostellum* small. *Pollinia* ovoid, the caudicle oblanceolate; the gland very small, ovoid. *Capsule* 1·5 in. long, triquetrous.

Sikkim: in the valley of the Teesta; elevation about 1,500 feet: flowering in July.

The flowers are white, with two blotches of brown on the calli of the lip. They open singly and smell of almonds.

SACCOLABIUM, Blume.

SACCOLABIUM PSEUDO-DISTICHUM, n. spec. *Stems* slender, 6 to 9 in. long, slightly branching. *Leaves* fleshy, lanceolate, the apex finely and minutely bifid, ·5 to ·75 in. long, and ·2 to ·25 in. broad. *Peduncle* ·35 in. long, sub-umbellately 5- or 6-flowered. *Flowers* ·3 in. in diam. bracts minute. *Sepals* and *petals* sub-equal, oblanceolate-oblong. *Lip* with a wide hemispheric spur; side lobes absent; terminal lobe broadly cordate, blunt, entire, fleshy, concave, deflexed, quite without callus. *Column* very short. *Pollinia* 2, entire, ovoid-globose; gland deeply 2-lobed.

Sikkim: at elevations of 6,000 to 8,000 feet: flowering time August to October.

This grows along with *S. distichum* Lindl. to which it is closely allied. As in that species the sepals and petals are greenish or yellowish with purple spots; the lip in this is yellow, except the terminal lobe which is orange. The chief distinction between the two is to be found in the lip which, in this, is entirely without calli of any kind; while, in *S. distichum*, the lip has two large calli situated at its base. The times of flowering of the two are moreover separated by three months.

Neottieæ.

CHEIROSTYLIS, Blume.

CHEIROSTYLIS FRANCHETIANA, n. spec. *Roots* short tubercular. *Stem* 6 to 9 in. long, the nodes slightly swollen. *Leaves* few, scattered, glabrous; linear-lanceolate and much reduced in the flowering plant; in the young plant ·25 to ·35 in. long, ovate and shortly petiolate. *Raceme* pubescent, 1- to 2-flowered. *Flowers* ·25 to ·3 in. long, with ovate bracts shorter than the ovary. *Sepals* oblong, curved, connate for one-third their length; the dorsal concave, shorter than the laterals. *Petals* broad, sub-quadrate, with an oblique central nerve. *Lip* slightly exceeding the sepals, abruptly deflexed from a saccate base; the limb very shortly clawed, deeply divided into two linear obliquely sub-acute rather divergent lobes. *Column* with two pyriform processes *immediately* beneath the rostellum. *Anther-beak* decurved. *Pollinia* sub-obovate, divergent when released from the anther; the caudicle acuminate and the gland oblong.

Sikkim: above Sureil; elevation 6,500 feet: flowering in August.

A very distinct species, named in honour of M. Franchet, the distinguished French Botanist who has so successfully elaborated the extraordinarily rich collections made by the Abbé Delavay in the highlands of South-Western China.

GOODYERA, R. Br.

GOODYERA HEMSLEYANA, n. spec. Height of entire plant 6 to 10 in. of which 3 in. are spike: roots few, thick. *Leaves* 3 to 5, scattered, unequal, broadly ovate, acute, glabrous like the stem, dark green with white nerves ·8 to 1·8 in. long and ·5 to 1 in. broad. *Flowers* subsecund, ·5 in. long, the bracts equalling the ovaries. *Sepals* 3-nerved, white with pink lips, the laterals ovate-acuminate, the dorsal oblong-lanceolate and clothed externally with long sparse hairs. *Petals* oblong-lanceolate, falcate, 3-nerved. *Lip* oblong with a sharp tooth at each side of the mouth of the sub-saccate base; the limb oblong entire, obtuse, the lamellæ scabrid. *Column* beaked. *Pollinia* elongate-obovate, with a short caudicle and a long narrow lanceolate pointed gland.

Sikkim: on Senchal; elevation 7,000 feet: flowering in July.

This differs from *G. vittata*, Benth., notably by its laxly hairy sepals, and by the scabrid lamellæ of the lip. Dedicated to Mr. W. B. Hemsley, F.R.S., formerly Assistant for India, now Principal Assistant, Herbarium, Royal Gardens, Kew.

GASTRODIA, R. Brown.

GASTRODIA DYERIANA, n. spec. Rhizome short, twice as thick as the stem, horizontal, with slender spreading roots. *Stem* about the thickness of a crow-quill, 12 to 15 in. long, bearing sheathing bracts ·5 in. long at intervals. *Flowers* 3 or 4 near the apex of the stem, ·5 or ·6 in. long, brownish, nodding. *Sepaline tube* cylindric, glabrous, the mouth 3-lobed. *Petals* minute, sub-rotund, entire, inserted on the sepaline tube near the bases of two of its sinuses. *Lip* as long as the column, but shorter than the sepaline tube, ovate-lanceolate, clawed, flat with undulate-crenate edges and with 4 parallel thickened lines from the base to nearly the tip: claw short, and bearing two sub-globular calli. *Column* with winged sides, the apex truncate and 4-toothed; *pollinia* narrowly and obliquely ovoid.

Sikkim: at elevations of 7,000 feet; flowers in August.

This is allied to *G. exilis*, Hook. fil., but that species has smaller flowers with fimbriate (or glandular) lateral petals and a lip with 2 long wing-like central lamellæ. This is less closely allied to *G. orobanchoides*, Benth., which has erect flowers and a ventricose sepaline tube. It agrees with *G. elata*, Blume, in having two callosities on the claw of the lip. Dedicated to Mr. W. T. Thiselton Dyer, F.R.S., C.M.G., C.I.E., Director of the Royal Gardens, Kew.

Ophrydeæ.

HABENARIA, Willd.

HABENARIA BIERMANNIANA, n. spec. Height of plant 9 to 15 in.; tubers cylindric-ovoid, 1·25 in. long, sparsely hairy. *Leaves*, 4 or 5, cauline, scattered, amplexicaul, lanceolate, acute, boldly nerved, 2 to 3 in. long. *Spike* 4 in. long, rather sparsely flowered; bracts linear-lanceolate, acuminate, exceeding the sessile and scarcely beaked ovaries. *Flowers* ·3 in. long. *Sepals* and *petals* sub-equal; *sepals* ovate, lanceolate, with oblique bases, concave, sub-acute, cohering and, with the triangular-lanceolate petals, forming a hood from the base of which the lip and spur projects. *Lip* fleshy, linear-oblong, tapering slightly to the obtuse apex, the side-lobes minute and tooth-like; spur about as long as the lip, curved, sub-obovate, dorsally compressed. *Column* arching over the mouth of the spur. *Caudicles* slightly shorter than the obovoid pollinia; gland short, linear-oblong.

Sikkim: on Sinchal; at an elevation of 8,000 feet: flowering in July.

A very distinct species dedicated to the memory of the late Adolf Biermann, for many years resident on the Government Cinchona Plantation in Sikkim, and who died as Curator of the Botanic Garden, Calcutta.

HABENARIA CUMMINSIANA, n. spec. Height of plant about 9 in. *Leaves* 2 to 4, unequal, crowded in the lower part of the stem with a smaller one a little below the spike, broadly elliptic to lanceolate, rather thick, 2 to 3 in. long and 1 to 1·5 in. broad. *Stem* angled between the small uppermost bract-like leaf and the base of the spike. *Spike* 3 in. long, rather densely-flowered, bracts longer than the slender beaked ovaries, their edges ciliolate. *Flowers* (to the tip of the spur) ·75 in. long. *Dorsal sepal* ovate ·25 in. long; the *laterals* narrower, wide-spreading, their edges ciliolate, ·4 in. long. *Petals* fleshy, slightly exceeding the dorsal sepal, triangular, sub-falcate, the inner edge irregularly crenate near the base, the outer edge entire, the apex sub-acute, the base truncate. *Lip* very fleshy, without side-lobes, longer than the lateral sepals, almost cylindric, abruptly deflexed from the thin flattened base (? claw), the surface of the cylindric part slightly caruneulate:

spur slender curved, longer than the ovary, slightly compressed laterally. *Column* very short: stigmas large, tapering towards the entrance to the spur. *Pollinia* cylindric, slightly clavate, rather longer than their caudicles and attached to them at half a right angle; gland small, subrotund.

Sikkim: at Gnatong; elevation 11,000 feet: flowering in July; collected by Mr. Pantling and also by Dr. Cummins, Surgeon to the detachment of troops stationed near the Thibet frontier, to whom we have dedicated the species.

This belongs to the section *Hologlossa* and is allied to *H. pachycaulon*, Hook. fil., but it is perfectly distinct from that species.

Contributions to the Theory of Warning Colours and Mimicry, No. I. Experiments with a Babbler (Crateropus canorus).—By FRANK FINN, B.A., F.Z.S., *Deputy Superintendent of the Indian Museum.*

Not long after my arrival in Calcutta in October 1894, I commenced some researches on the common "warningly coloured" butterflies of the locality, in the hope of supplying some of that experimental proof of the unpalatability of such species, the insufficiency of which Professor Poulton (the Colours of Animals, p. 227) so justly deplores. My most complete experiments were made with the common Babbler *Crateropus canorus*, a representative and abundant insectivorous bird in India, whose habit of going about in small flocks is indicated by its native name of "sat-bhai" and the English ones of "Seven Brothers" and "Seven Sisters." This bird, as it frequents trees and bushes, though often feeding on the ground in the open at a short distance from these, must constantly encounter butterflies in repose; that it often succeeds in capturing them on the wing I very much doubt, its weak clumsy flight being certainly most ill-adapted for such a performance. Though it can swallow whole butterflies of considerable size, it often transfers its prey to one foot, and thus holding it, easily picks off the wings. In confinement this species speedily becomes tame enough to feed from the hand, and will eat table scraps, boiled rice, &c., quite readily. So tame were some birds which I kept, that, when after being kept about a fortnight (some of them longer) they were released, they stayed about the compound for about three days, still willing to take insects from my hands. Thus I had an opportunity of checking the results of the experiments I had made on them during their incarceration—a piece of good fortune which has not so far, I believe, fallen to the lot of any previous experimenter.

As I intend to make this paper the first of a series, in which I shall record the results obtained by experiments with several more species of birds and with insectivorous animals of other groups, I refrain at present from drawing any general conclusions; such as can be drawn from the experiments given below will be perfectly obvious to any one who has studied this subject.

I have much pleasure, however, in here expressing my sincere thanks to Dr. Alcock, Superintendent of the Indian Museum, for the kind interest he has taken in my experiments. To him I owe the accommodation of a small aviary for some of my birds, and permission to use the services of the Museum collectors for obtaining insects—requisites indispensable for successful experiments.

I have also to record my obligations to Mr. L. de Nicéville, and to Mr. Barlow of the Museum staff, for assistance in naming the insects herein and after dealt with.

EXPERIMENTS WITH BABBLERS IN CONFINEMENT. SERIES A.

November 11*th.*—Offered various insects to four Babblers (*Crateropus canorus*) which I had just bought and placed in a large hutch, after I had given them some boiled rice, which they ate readily. They seized cockroaches (*Periplaneta americana*) and *Catopsilia* readily, squabbling over them, and one ate a *Terias* whole. They tackled two *Danais chrysippus* just as readily, and I thought I saw one swallowed; certainly there seemed no difference in their behaviour.

Later on in the day, giving the birds two more Danaids, they certainly seized and mauled them, but left them for a little while at any rate; and I found pieces of body and wing from the previous specimens. But these disappeared later. A *Delias eucharis* was torn to pieces, and some of the body at least eaten before my eyes.

November 12*th.*—The Babblers had still some rice left this morning; I took it away and gave them butterflies. I saw *Danais chrysippus* and *Delias eucharis* mauled and left, while of a specimen of a protectively-coloured species part at least was eaten. *Terias* to-day was pecked and left, and even the common Hesperid and a *Catopsilia* pecked about much; and though I believe they were eaten in part, I could not be quite sure.

November 13*th.*—This morning the Babblers had no food and were hungry when I came to them. They took and mauled three *Danais chrysippus*, but I saw none eaten; even one with the wings removed was left. One of them battered and partly at least ate a skipper. A larger skipper (*Tagiades*) was seized, mauled, and apparently eaten, A *Catopsilia* had its wings picked and knocked off and was eaten. A

Delias eucharis (minus abdomen) was mauled and left. A female *Hypolimnas misippus* was taken, and part at least was eaten. The birds take all butterflies one gives them and batter them a bit. Some of the *Danaids* may have eventually been eaten.

Next day I released these Babblers, not having got any very conclusive results from them. They did not seem very keen on butterflies, and were perhaps not healthy. Moreover it was difficult to observe them in a hutch.

EXPERIMENTS WITH BABBLERS IN CONFINEMENT. SERIES B.

December 11*th*.—A fresh Babbler confined alone pulled about an *Euproctis* moth for a time, but I found it left afterwards. I gave him separately an abdomen which he had knocked off, but did not see it eaten.

December 12*th*.—Babbler appeared to eat a bit of an *Euproctis* abdomen.

December 13*th*.—This Babbler, with another, and other birds being now in a small aviary, with ½ inch-mesh netting, I saw one of them seize an *Euproctis*. A Babbler also pulled another of these insects to pieces, but did not eat it as far as I saw.

December 14*th*.—A Babbler ate a *Papilio demoleus** whole, but did not eat a *Danais chrysippus* and *Delias eucharis*, though descending from his perch to eat a *Catopsilia*.

December 15*th*.—The birds in the aviary being hungry, I put in some butterflies. I saw a Babbler eat a *Terias*. Later on, after the birds had had some food (meal moistened with water) I put in more butterflies, and saw a Babbler eat a *Danais genutia*, *D. chrysippus*, and *Delias eucharis*. Two *Euproctis* were eaten by Babblers. Two *Danais genutia* were seized and torn to pieces, and part of one was apparently eaten by the Babblers, which showed some signs of apparent dislike; of two *D. chrysippus* then given, one was torn up and eaten, and the other torn up and rejected, by a Babbler, which then took and left a *D. genutia* and *Delias eucharis*, and then went and ate some rice. After this I released the other birds in the aviary, as they had no chance with the Babblers. About this time I added a third specimen of the latter.

December 16*th*.—One of the Babblers took and ate nearly whole, after much rubbing and pecking, a caterpillar rather larger and much hairier than that of the Buff-tip (*Pygaera bucephala*). I think this is the larva of whose hairs I recently got my fingers full. The bird had food by it, and had had cockroaches in the morning. Another caterpillar, smaller, and covered with long whitish hair, with two pencils of hair near the head, was untouched.

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* *erithonius* auctorum.

December 17th.—A Babbler ate an *Euproctis* readily. The hairy caterpillar not eaten yesterday was still untouched, so I took it away.

December 18th.—The Babblers ate four specimens of *Euproctis*; they were hungry. They ate some *Catopsilia* and other non-warningly-coloured butterflies with relish, and ate also three *Danais genutia*; but only one of these was eaten directly by one and the same bird, and the others were evidently not relished much, for the birds ate *Papilios** of equal size much more readily. Specimens of a black beetle with yellow patches (*Mylabris sp.*) were taken, and the elytra got rid of, but the birds did not seem to like the body, and I saw one left.

December 19th.—The birds were hungry in the morning, and one ate a *Danais chrysippus* readily enough. Then a *D. limniace* was readily eaten. An *Euploea* was also eaten; the bird pecked it about on the ground much first, seeming especially to attack the yellow anal organ. A cockroach subsequently put in excited more competition than these butterflies, and caused a fight. Several *D. genutia* and *chrysippus* were then turned into the aviary, and two of the Babblers immediately attacked them. I gave them some *Euproctis*, and they ate some, I believe all, of them. By this time, too, they had torn all the *Danais* to pieces, and as I saw no bodies lying about, I presume eaten them, though they had now some plantain (a food they did not relish). In the evening an *Euploea* was eaten, though there was food in the cage.

Yesterday, I think, I put the hairy caterpillar which had previously escaped destruction, in again. It remained untouched for a day, and next morning I found it dead in the water. The birds seemed never even to look at it.

December 21st.—Two of the Babblers had been placed in the cage of a Bhimraj (*Dissemurus paradiseus*), and this bird put in the aviary with a Laughing Jackass (*Dacelo gigas,*) (not used in these experiments) and one Babbler. Another of the hairy caterpillars noted previously (*Dec. 16th*) as eaten by a Babbler remained untouched for some time, but afterwards I found it dead and deprived of its hair, but uneaten. I don't know which bird did this. I put a mixed lot of butterflies in the aviary, and saw the Babbler, which was hungry, three times take and eat a non-warningly-coloured butterfly in preference to *Danais chrysippus* and *D. genutia*, which it could easily have caught. Indeed, I saw it take and drop a *D. genutia*, and seize and eat a *Papilio** instead. It ate a grasshopper before any butterflies. At the end of the day two *Papilios* (one torn) and most if not all of the warningly-coloured species were left, though the Babbler readily ate grasshoppers. Yet, when I gave an *Euploea* to the other two Babblers in the cage, one took and ate it whole, though they had had some grasshoppers, and did not eat some *Danais chrysippus* and *genutia* which I put in, so far as I saw.

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* Not *P. aristolochiæ*.

Between this last date and January 3rd, I took, with one exception, no notes on the behaviour of the Babblers. I added during this time other specimens and had as many as twelve at once. However, I turned out three of these, and started the next series of experiments with nine birds, including the three used in the above series of experiments. I have a note for December 28th, on which date I gave the Babblers a small black and yellow zygaenid moth, which none touched, though some evidently saw it. The other birds had been removed.

Before beginning to take the systematic notes which follow, I had more than once given the birds butterflies, and had seen *Danais*, &c., devoured. I cannot give the exact dates of the experiments following, but they took place on and after January 3rd of 1895, on consecutive days for the most part. I have endeavoured to record each day's experiments separately. One and possibly two, of the present birds were young, but my notes are not quite clear on this point.

EXPERIMENTS WITH BABBLERS IN CONFINEMENT. SERIES C.

I. Put in, in the evening, first some grasshoppers, which were immediately devoured, then some butterflies (*Danais chrysippus*, *genutia* and *limniace*, *Euploea*, *Papilio aristolochiae* and some non-warningly coloured kinds). The *Danainae* were most numerous, and all were attacked, but the non-warningly-coloured species disappeared first. However, all the others but one *Danais genutia* and the *Papilio aristolochiae* were killed and more or less mauled, and some eaten. I saw one bird take and reject an *Euploea*, and another eat one. The *Papilio aristolochiae* was refused four times at least, and sometimes looked at and not touched. I then took it out. A very worn female specimen of *Elymnias undularis* was one of the first insects seized by the Babblers, as also were the *D. limniace*. There was food in the cage at the time.

II. The butterflies offered and partly left yesterday had disappeared this morning, with the exception of a few bits of wing, though there was still some food. In the evening I put some butterflies (one each of *Danais chrysippus*, *genutia*, and *limniace* and some other kinds), into an insect cage, and placing this in the aviary watched the result. One bird went in and took out a *Catopsilia*, which seems to be a favourite. Another (young) went in and took a female *Elymnias undularis*, though he could see its mimetic upperside; but he lost it. The three *Danais* were the last left. Even two of these were ultimately taken, and I suppose eaten; I did not watch the whole process. The other, a *D. chrysippus*, was at the top of the cage, and possibly hard to get; I took it out. The young Babbler took, instead of a *Danais genutia*, a specimen of *Nichitonia xiphia*, which he seemed not to like. However, later on I could only find a few bits of wing left of all the butterflies I had put in, so I suppose it was eaten after all. The birds had had some grasshoppers first.

III. Put a *Danais genutia* into the aviary, where a Babbler took it and ate it whole. A *D. chrysippus* was taken by a Babbler, which was pulling off the wings with no great eagerness, when another took it away and ate the body. An *Euploea* (rather crushed) was eaten readily enough, with part of the wings, by a Babbler. I then put in several *D. chrysippus* and *genutia*, and the birds ate them all and fought over them. I saw one throw up a body two or three times before swallowing it. A *D. chrysippus* was first taken when I put in two of each kind (*D chrysippus* and *D. genutia*) dead. The birds had had some grasshoppers some hours before. Some time afterwards I killed and put in—

(*a.*) One each of *Danais chrysippus*, *genutia*, and *limniace*, *Euploea*, and *Catopsilia*. A bird snatched the *D. limniace* before I took my hand away, and the *Catopsilia* was not, I think, the next taken. The *Euploea* was swallowed whole.

(*b.*) Two *D. chrysippus* and a large brown species put in; a bird first took the latter.

(*c.*) The same two *D. chrysippus* were put in together with a *Junonia*. Two birds advanced at once and one took the *Junonia*, the other a *D. chrysippus*. The *Junonia* was eaten before my eyes, and I saw the other begun upon.

(*d.*) I repeated this experiment with two *D. chrysippus* and another protectively-coloured specimen. This latter was taken by the first bird which came. About this time I saw a bird eat the body of a *Danais*, and soon found two lying about. The birds pecked but did not seem to care for them.

(*e.*) I put in a *Catopsilia* and two *D. chrysippus*; two or three of the birds came at once. One took the *Catopsilia* and another a *D. chrysippus*.

(*f.*) Put in a *Catopsilia* and one *D. chrysippus*. The first comer took the former, and immediately afterwards the latter was taken. The *Catopsilia* was eaten at once with some of its wings. The body of the other was eaten after some rubbing; I do not know whether the eater was the individual which took it.

(*g.*) Put in another *D. chrysippus* and a small fritillary, *Atella phalanta.* A bird took and ate the latter; the former was unregarded for a little time at least, then a bird took and ate at least some of it.

(*h.*) A Babbler took and pulled about a *Delias eucharis*, but then left it. I offered it again, and it was refused by a bird or two, though another appeared to eat part of it.

I then put in one *Danais genutia*, two *D. limniace*, and several *D. chrysippus*, which were immediately attacked as they fluttered about. All of these last mentioned were soon killed and torn to pieces, and I saw at least three eaten, though the birds had rice, &c., in the aviary.

IV. The birds had had no insects but a fly or two when I gave them (dead).

(*a.*) Two *Danais chrysippus* and one *Papilio demoleus.* The latter was taken first. I took the former away and

(*b.*) Presented them again with another *P. demoleus.* Two birds, one young, went for the *Papilio ;* the older got it, and then the other bird took a *D. chrysippus.*

(*c.*) Put in two more *D. chrysippus* and a *P. demoleus.* A bird advanced and deliberately chose the latter.

(*d.*) Two more *D. chrysippus* and a *P. demoleus* were put in. The latter was taken first.

(*e.*) Same experiment repeated with same result.

(*f.*) One *D. chrysippus* and one *P. demoleus* put in; first comer chose the latter.

The birds did not seem to me very eager for the *Papilios*, though they so obviously preferred them. All the butterflies were eaten, or at least torn to pieces, and I saw no bodies lying about. There was rice in the food-bowl notwithstanding.

V. Offered the Babblers a *Papilio aristolochiae ;* a bird took it and tore off the greater part of the wings, but left the body. Another took this and tore off the thorax, and left the abdomen. A *Danais limniace* was then eaten, at least most of the body, I think by one of the individuals which had refused the other.

(*a.*) Put in the aviary two *Danais chrysippus* and a *Papilio demoleus.* One of the former was first taken, then the *Papilio.*

(*b.*) The experiment was then tried with two *D. chrysippus* and a *Papilio polites.** A *D. chrysippus* was first taken, then *P. polites* by a young bird.

(*c.*) Two *D. chrysippus* and a male *Elymnias undularis* were then put in. *E. undularis* was taken first and swallowed whole. These sets of butterflies were put in dead.

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* *P. pammon* auctorum.

The Babblers then took and left two *Papilio aristolochiae*, though by this time all the Danaids and the *Papilio polites* were more or less torn up and eaten, the latter all but the wings, I think. One of the *P. aristolochiae* was not even killed at first. There was other food in the cage.

(*d.*) Offered the birds a *Danais chrysippus* and a *Catopsilia*. Two of them came at once, so I was not quite certain; but I think the latter was preferred.

(*e.*) Repeated the experiment with two *D. chrysippus* and one *Catopsilia*. The latter was distinctly chosen by the first comer.

(*f.*) Repeated the experiment with two *D. chrysippus* and a *Junonia*. The first comer (young bird) took a *D. chrysippus*, the second the non-warningly-coloured species.

(*g.*) Put in a *Junonia* and one *D. chrysippus*. One bird took one and another the other.

A Babbler took a *Papilio polites* readily. I saw no traces of the *P. aristolochiae* about by this time.

(*h.*) Offered the Babblers a *Papilio polites* and two *Danais chrysippus*. The two first comers took the latter; but the former was soon taken.

(*i.*) A *Papilo demoleus* and a *Danais chrysippus* offered. One bird came, and chose the former; but the *Danais* was soon taken.

(*j.*) One *Catopsilia* and one *D. chrysippus* were offered. The former was chosen by the first comer.

There was some rice still left in the vessel at this time.

VI. (*a.*) Offered to birds, in my hand, one specimen each of *Danais chrysippus*, *Papilio demoleus*, and *P. polites*. The last named was taken first, and then the *Danais*.

(*b.*) A protectively-coloured butterfly was offered in my hand to the birds, together with a *D. chrysippus*. The *Danais* was taken first.

(*c.*) A *Danais limniace* and a *Papilio demoleus* were offered; the latter was taken first.

(*d.*) A protectively-coloured butterfly (same species as above); again offered with a *D. chrysippus*. The *Danais* was taken first; it was nearest to the bird.

(*e.*) Same experiment repeated with another *D. chrysippus*; the *Danais* again taken first.

(*f.*) Same experiment repeated; this *Danais* was also taken first, though the other species was eaten readily by the next bird.

(*g.*) A small satyrid butterfly offered with *Danais limniace* in my hand. The former was taken first.

(*h.*) *D. limniace* and *Huphina phryne* offered. Former taken first, but latter eaten readily.

(*i.*) Same experiment repeated. This time *Huphina* was taken first.

(*j.*) Living specimens of *Danais chrysippus*, *D. genutia*, and *D. limniace*, *Euploea*, and *Delias eucharis*, together with two dead specimens of the last, put in. Many of these were attacked at once. The birds had no food by them this time.

VII. (*a.*) Offered to the birds *Papilio demoleus* and *Danais limniace*, one of each. Former taken first.

(*b.*) Same experiment repeated with same result.

(*c.*) Experiment again repeated; same result.

(*d.*) Same species of *Papilio* offered with a female *Nepheronia hippia;* the *Papilio* was taken first. The upperside was of course exposed and the insects killed, as usual in these comparative experiments of mine.

The birds had food by them. They ate to-day one specimen of *Nichitonia xiphia*.

(*e.*) An *Euploea* and a *Papilio demoleus* offered; the former was taken first, but the latter swallowed nearly whole.

(*f.*) Experiment repeated; *Papilio demoleus* taken first.

(*g.*) Experiment again repeated; same result.

The Papilios were eaten more readily, usually whole, and apparently more relished.

(*h.*) Experiment again repeated; *P. demoleus* taken first, but the bird which took it did not seem very eager, and did not mind another robbing it of its prey. But it had had others.

(*i.*) Experiment repeated; *Euploea* taken first.

(*j.*) Protectively-coloured species offered with a *Danais limniace;* former chosen and eagerly eaten.

Two or three *Terias* were eaten to-day. A lot of *Danais* (*chrysippus*, *genutia*, *limniace*) and *Euploea*, and a few non-warningly-coloured specimens turned in. All were attacked, but the latter were eaten first, and with more relish, though some *Danainae* were swallowed whole.

VIII. (*a.*) Offered the birds one each of *Papilio demoleus* and *Danais chrysippus*. Both were taken almost simultaneously; the latter first if anything.

(*b.*) Offered, in my hand, one each of a *Catopsilia* and *D. chrysippus*. Former chosen.

(*c.*) Offered one each of a *Catopsilia* and *D. genutia*. The former was chosen, though another bird made a dash at the *Danais*.

(*d.*) Same experiment repeated; *Catopsilia* again chosen.

(*e.*) Small brown Satyrid butterfly offered with *D. genutia;* former was deliberately chosen.

Some specimens of *Euploea*, *Danais chrysippus*, and *D. genutia*, were given alive, and immediately attacked by some of the birds.

Two *Papilio aristolochiae* were tried and left, while some of the *Danainae* above-mentioned were being torn and eaten, though some were still alive or uneaten. The birds had food by them at the time. Later on offered them—

(*a.*) A *Danais genutia* and a brown Satyrid species. The first comer having a fair field, first took the former, and then dropped it and took the other.

(*b.*) Last experiment repeated; two birds came at once, and the *Danais* was first taken.

(*c.*) Offered a *Junonia* and a *D. genutia;* the former was taken first.

(*d.*) Put in one *Catopsilia*, one *Danais chrysippus*, and two *Papilio polites* (one mimetic of *P. aristolochiae*, and the other not). The first comer deliberately chose the *Catopsilia;* the next looked at the remaining three and turned away; then a *P. polites* was taken, and I saw it swallowed nearly whole—I could not say whether by the same individual. The birds had food by them. None of the butterflies previously put in were to be seen. They did not seem very eager even for *Catopsilia*.

IX. Offered to the Babblers killed or disabled specimens as follows:—

(*a.*) One *Danais chrysippus*, one *Catopsilia*. Former taken first.

(*b.*) One *D. chrysippus*, one *Catopsilia*. Latter taken first, by young bird.

(*c.*) Same experiment repeated; *Catopsilia* taken first.

(*d.*) Same experiment repeated with same result.

(*e.*) One *Danais genutia* offered with one *Catopsilia*. Latter deliberately taken first.

(*f.*) One female of *Elymnias undularis*, one *Catopsilia*. Latter taken first. The mimic also taken and swallowed whole.

(*g.*) *Papilio demoleus* and *Danais limniace*. Former taken first.

(*h.*) Same species of *Papilio* and an *Euploea*. *Papilio* taken first.

(*i.*) *D. chrysippus* and *Papilio polites*. Both of these were taken at once.

(*j.*) Same experiment repeated. The first comer took neither, the second *Papilio polites*.

(*k.*) Protectively-coloured Satyrid and *D. chrysippus*. Former taken first, and swallowed whole.

(*l.*) Same experiment repeated. Protective species taken first, and eaten, by the same bird.

This bird again ate one of this Satyrid; though there were *Danais limniace* and *chrysippus* uneaten in the cage. A *Catopsilia* was then put in, and the same bird took and began upon it, when it was taken and soon swallowed by another.

Some *Danais genutia* and *limniace*, *Euploea*, and *Delias eucharis* were then thrown in, but though one or two birds pulled them about, I saw none eaten. The birds were now going to roost. They had had no insect food before on this day, but a number of cockroaches the day before.

X. Offered the birds—

(*a.*) One *Danais chrysippus*, one *Catopsilia*. Latter chosen.

(*b.*) One *D. genutia* one *Catopsilia*. Former chosen, by young bird.

(*c.*) Same experiment repeated. This time the butterflies were on my hand, held on the floor; a bird swooped from the perch on the *Catopsilia*, and took it.

(*d.*) Same two species offered. Both were taken at once.

(*e.*) One protectively-coloured specimen, one *D. chrysippus*. Former deliberately taken.

(*f.*) One *Huphina phryne*, one *D. chrysippus*. Former taken first.

(*g.*) One *Papilio demoleus*, one *D. chrysippus*. Former chosen, but birds not eager.

(*h.*) Same experiment repeated. As the first comer was hesitating, and seeming to prefer the *D. chrysippus*, another snatched the *P. demoleus*

(*i.*) One small protective Satyrid, one *D. chrysippus* offered. The first comer in the last experiment deliberately chose the former, though the *Danais* was nearer.

(*j.*) *Papilio demoleus* offered with *Euploea*. Latter taken first.

Put in three *Euploeas*, one *Danais genutia*, one *D. limniace*. Last chosen deliberately by young bird. I threw in two more *Euploeas* and two *D. limniace*. The former were this time seized, but one bird soon left its prey, and I did not see the other specimen eaten, though I saw one *Euploea* swallowed whole.

In the afternoon of the following day I released these birds, which, as observed in the beginning of this paper, still continued about the place. Thus I was enabled to make the following experiments with them.

EXPERIMENTS WITH BABBLERS AT LIBERTY.

January 16th.—As the birds were hopping about the garden eating termites, &c., I gave them a number of butterflies, mostly dead or disabled, comprising specimens of *Danais chrysippus*, *D. genutia*, *D. limniace*, and *Euploea*, with *Papilio demoleus*, *Huphina phryne*, *Catopsilia*, *Junonia*, &c. There was no doubt that these latter non-warningly-coloured species were preferred to *Danais* and *Euploea*. All as far as I saw were eaten, while though the *Danainae* were picked at, and I think one or two of them eaten, I often saw them looked at and then passed over in favour of a *Catopsilia* or other palatable species.

I offered two specimens of the female of *Nepheronia hippia*. The first one, which was displayed, was passed over by a bird in favour of a *Catopsilia*, though the same individual then tried and ate it. The second specimen, whose wings were half closed, did not seem to be noticed at first, but on being thrown to a bird it was picked up and eaten. I saw one bird, eating a *Catopsilia*, leave it and try a *Danais genutia*, and then return to its former prey. I saw one bird try unsuccessfully to catch an uninjured butterfly on the wing; decapitated specimens were caught with some trouble as they fluttered.

This day they four times refused a red, black and white bug (*Dysdercus* sp ?). I thought *Euploeas* were least disliked of the unpalatable butterflies given.

January 17th.—This morning I found lying about wings of the butterflies rejected overnight; but these birds may not have eaten the bodies.

I put out several *Danais genutia*, which were not regarded with favour, though one or two were taken. A bird which had left one took and ate a skipper.

Another protective butterfly was eaten in preference to *Danais genutia* and *D. chrysippus*. A *Junonia* was eaten readily.

A male *Elymnias undularis* was eaten readily.

Two *D. genutia* were rejected, but a protectively-coloured species taken.

Some specimens of *Huphina phryne* were taken readily and eaten.

Two birds tried to catch a *D. genutia* on the wing.

A bird took a *Junonia* from my fingers and apparently ate it.

Another protectively-coloured species then taken.

Another attempt made to catch a flying *D. genutia*.

Two male specimens of *Elymnias undularis* taken in succession from my hand.

D. genutia was taken from my hand, but it escaped, and three birds tried to catch it.

Another protective species was taken.

A specimen of a protective species was taken, squabbled for, and eaten.

A protective species was again eaten; then a male *Elymnias undularis*, swallowed whole.

A *D. genutia* was allowed to remain perched on a shrub.

I did not see one *Danais* at this time eaten, though one *D. genutia* was torn up; but I found the body left. Afterwards, however, I saw one *Danais* (I do not know which species) eaten, and then a *D. genutia*; this latter was thrown up several times. Another was eaten; and then I had to leave the birds.

January 18*th*.—The birds were still about, though one seemed to be missing. I saw some *D. chrysippus* lying about, left from yesterday. In the morning I offered the Babblers a large brown moth and a cockroach, which were taken. The birds, however, did not seem to wish for some rice, &c., which I threw out, though such had formed their ordinary food in confinement, and they had eaten some the day before.

In the late afternoon I offered them some butterflies, mostly decapitated, chiefly *Danais genutia*, but also *D. chrysippus*, *D. limniace*, *Euploea*, and *Delias eucharis*. None of these were eaten, as far as I saw, as long as other species could be had, and only one, a *D. genutia*, afterwards. On the other hand, male *Elymnias undularis*, *Catopsilia*, and other non-warningly-coloured specimens were readily devoured, and even taken from my hand, while specimens of *D. genutia* fluttered about. A male *Nepheronia hippia* was taken and eaten. These experiments left not the slightest doubt in my mind as to the unpalatability of *Danais* and the other "warningly-coloured" forms. Birds would often only look at them, and soon left them when picked up.

Next day the birds had disappeared, and so ended my experiments with this species.

A list of the Butterflies of Sumatra with especial reference to the Species occurring in the north-east of the Island.—*By* LIONEL DE NICE'VILLE, F.E.S., C.M.Z.S., &c., *and* HOFRATH DR. L. MARTIN.

[Received 1st; Read 7th August, 1895.]

The island of Sumatra, with Java, Borneo and Celebes, forms one of the Great Sunda group of islands. Rather more than half as large as Borneo and more than twice as large as Java, it is nearly as large as France. Some 1,070 miles in length, with an average breadth of over 120 miles, it has a total area of about 128,000 square miles, or 8,000 more square miles than are contained in the United Kingdom. Oblong in shape, with its longer diameter running north-west to south-east, the island lies between 95° and 106° Long. E., and is almost exactly bisected by the equator, six degrees north and south of which it extends. On the west it is washed by the great Indian Ocean with no adjacent land except a parallel chain of small islands of which Nias is the largest; to the east is the shallow Strait of Malacca, with the Malay Peninsula and the large island of Banka and a few other smaller ones at no great distance. To the south lies the large island of Java, separated only by the narrow Sunda Strait; to the north the Nicobar and Andaman chain of islands seem to form a natural continuation of the enormous volcanic range of mountains that beginning in the Banda Sea, extends through the islands of Wetter, Flores, Sumbawa, Lombok, Bali, Java and Sumatra, and ends in the Andaman Sea. Throughout the whole length of Sumatra extends a mountain-system of several parallel ranges, with large central plateaus or highlands. In this system, called "The Barisans," the highest mountains are mostly volcanoes, which reach an altitude of about 15,000 feet in Mount Kassoumba. Other lofty peaks are Indrapura, 12,255; Lusi, 11,000; Dempo, 10,562; Abong-Abong, 10,000; Ophir, 9,940; Merapi, 9,640; Talang, 8,470; and Salamanga, 6,825 feet. Two of these volcanic cones, Merapi and Talang, are said to be still active. On the west coast the mountains rise abruptly from the Indian Ocean, and in consequence there is no alluvial soil on that side of the island; whilst on the east coast there are large alluvial plains, abounding in water, and intersected by large rivers. This plain is increasing every year, being gradually built up by a broad belt of mangrove-swamp. In the northern half of Sumatra in the above-mentioned alluvial belt, between 3°–4° N. Lat. and 98°–100° E. Lon., are situated the three small Malayan sultanates of Langkat, Deli, and Serdang (with the butterfly fauna of which this paper deals), that are world-renowned for the splendid tobacco grown there, which is almost entirely used for making the outer covers of cigars. The southern and western borders of these sultanates are formed by the Barisans, here named the Battak mountains from the inhabitants of these ranges being several tribes of anthropophagous Battaks, the aborigines of Sumatra. The different ranges of the Battak mountains here include the extensive Toba highlands, which surround the large and for long mysterious Lake Toba that lies in their centre. North of this lake is the Karo plateau, inhabited by the Karo-Battak tribe, and forming the true "hinter-land" of the above-named sultanates. The northern boundary of this region—as we deal chiefly with this part of the island, we will call it "our area"—is the mountainous land of the Gayoe and Allas tribes, who are Mahomedans; to the east lies the large sultanate of Siak. The altitude of the Karo plateau may be estimated at about 4,000 feet; the highest peaks of the Battak mountains are Simanabum, nearly 8,000 feet in height, and Sebayak, which is a little over 7,000 feet.

Owing to its situation, protected on the south and west by the Barisans, and with the narrow and quiet Strait of Malacca, beyond which again is the Malay Peninsula also with a high central range to the north and east, there is no monsoon in our area, and consequently neither a true rainy, nor a true dry season; though during the south-west monsoon there is a little more rain than usual, say about 18 days in the month, while during the north-east monsoon there are only 11 rainy days in the month. Nevertheless there is a yearly average rainfall of about 90 inches (2,200 mm.); this, together with a mean daily temperature of 80°, and an extreme daily range of 12·6° Fahrenheit, makes a very damp and unhealthy climate, but fits it for a high development of insect life. The plains of the three sultanates, the outer ranges of the Battak mountains, and the Battak mountains themselves, which include the Karo Central Plateau, are the localities where all the species of *Rhopalocera* contained in our collections and enumerated in the following list, have been captured, except a few from the Gayoe lands and from Indragiri, another Malayan sultanate south of Siak, and nearly opposite to Singapore.

The plains were formerly entirely covered with large, dense, lofty primeval forest, but this has had to make way for the miserable tobacco plant, of which the cultivation began about the year 1865. The primeval forest once destroyed by fire and the axe does not grow again, but is replaced by a high-growing and tenacious species of grass, called "Lalang" in Malay (*Imperata arundinacea*, Cyrill.), which now entirely covers all the ground temporarily unoccupied by tobacco. The cultivation of the nicotinous plant pays so highly and yearly so increases in extent, that there is now no forest whatever left in the true tobacco districts of Deli—Deli being the name generally used as a topographical unity for all the three tobacco-yielding sultanates—and in consequence, as *Imperata arundinacea* is not liked by any animal, there have disappeared not only all the interesting pachyderms, but also all the butterflies whose food-plants are in the forests. Ten or twelve years ago, or even six or eight, certain species, for instance the different black and brown *Euplœas*, were to be found commonly everywhere. But then all the forest had not been cut down; now these species are never seen, having retired to the well-wooded outer hills and mountains, or to the boundaries of the tobacco districts north of Langkat, and to the south in Serdang. Only the most common species which feed on the *Gramineæ*, garden vegetables, cocoa-nut palms and other fruit-trees and on ubiquitous plants remain. So it has become necessary to send our collectors far away out of range of tobacco cultivation.

Regarding the elevations of the different places where our captures were made, we could generally distinguish four well-separated zones :—

1. The zone of the plains from the sea-board to the elevation of Namoe Oekor (266 feet), with the subzone of the beach, situated quite close to the mangrove fence of the coast. Laboean and the Saentis Estate are localities in this subzone, whereas Mabar (25 feet), Paya Bakong (40 feet), Stabat (45 feet), Medan, the capital of the Deli district (50 feet), Selesseh (90 feet), and Dr. Martin's later station at Bindjei (100 feet), all belong to this first zone.

2. The zone of the outer hills, beginning some few miles south of Namoe Oekor and extending to Bekantschan, the elevation of this district being between 300 and 2,400 feet. Kampong (village) Singhapura (725 feet), Namoe Tampis and Namoe Blanka (1,050 feet), are good localities in this zone, to which may also be added the villages of Bohorok and Kepras, situated more to the west in the direction of the Gayoe country.

3. The zone of the higher mountains which begins south of Bekantschan, and ends on the margin of the Central Plateau, with the frequently-visited valley of the Soengei Batoe (4,125 feet). Between Bekantschan and Soengei Batoe there is the Bekantschan pass, leading to the Central Plateau, at an elevation of 4,785 feet.

4. The Central Plateau itself, with no elevation less than 4,000 feet. The Kampongs of Naman, Beras Tepoe, Soekanaloe, and Atjih Djahé more to the south in the direction of lake Toba, were the spots where our collectors were most successful.

Two other good collecting places have to be mentioned. The first is Paya Bakong which is situated quite in the centre of tobacco-land.

Owing to the fortunate presence of an undrainable swamp on either side of the little Diski river, it still possesses a patch of high forest of several square miles in extent, in which many of the rarer species such as *Charaxes*, *Papilio hermocrates*, Felder, and *P. delessertii*, Guérin, have found an asylum. The second, the often-mentioned Selesseh, lies at a distance of six miles from Bindjei, and is on the border of tobacco cultivation and immediately to the west of the village of Selesseh, where there is splendid continuous primeval forest which yields precious crops of rare butterflies, especially on the banks of the large Wampoe river.

Our collectors were usually Battaks from the two mountainous zones; to Selesseh, however, and other places in the plains we usually sent two very clever Chinamen. The latter were most zealous if given some advance of pay, which allowed them to buy some necessary provisions and the never-to-be-omitted opium. On their return with their bag of captured butterflies they received the balance of their monthly salary, together with an extra bonus for any rarer spoil they may have been fortunate enough to capture. The Battaks received some rice and salt fish, enough to feed them for a fortnight, before leaving for the mountains, but as they are inveterate gamblers, and will not turn out of their villages till they had lost at some game of hazard or another every cent they possess, no advance in cash was given them. When all their money from the fruits of their last expedition was lost, then they asked for a tin box, some butterfly papers and a net, and moved off with their provisions very slowly and reluctantly southwards to the evergreen mountains. Being moreover very lazy, it was impossible to grant them a fixed salary, so they were paid solely by results, and by valuation of the captures they brought in. On their return from the mountains after delivering the insects and receiving their dollars, they immediately set to gambling, and did not appear again on the surface so long as a cent remained. All Battak collectors, even the most intelligent and zealous, lose their interest in the subject after a certain time, and would return with hardly anything, or a few common and useless species, and in consequence had to be discharged—a very great inconvenience, as it always takes a long time to break in a native as a good collector. Of course there was always lost or damaged many a rare and fine specimen through the awkwardness of a new collector. A few Gayoe collectors also were employed, who went farther away to the north and west to the Gayoelands. They brought various species of *Charaxes* largely, *Prioneris clemanthe*, Doubleday, *Ixias ludekingii*, Vollenhoven, *Hebomoia borneënsis*, Wallace, *Papilio perses*, de Nicéville, and *P. payeni*, Boisduval, all of which are very rare or do not occur at all on the Central Plateau. In

1893 and 1894, Mr. de Nicéville induced three amateur collectors in British India to send down to Sumatra some of the well-known Lepcha collectors from Darjiling to Dr. Martin's care. These men met with very good success, though at first they were afraid to mix with the cannibal Battaks and refused to go to the mountains. However, after giving them a Battak guide and interpreter they went off to the hills regularly, and did very well there.

A large proportion of the really rare endemic species of butterflies found in the island occur only in the mountains, from the lower slopes of which and from the high Central Plateau, alone, are obtained the interesting species that are common to the eastern Himalayas and Sumatra, clearly showing the aforetime continuation of the Asiatic continent by way of the Malay Peninsula through Sumatra to Java and Bali, between which latter small island and the equally small island of Lombok occurs the deep depression in the sea floor which forms "Wallace's Line," dividing the Indo-Malayan from the Austro-Malayan region. The most remarkable of these species which are common to the Sikhim Himalayas and the mountains of Sumatra, but which have not as yet been recorded from the intervening Malay Peninsula are—

Enispe euthymius, Doubleday.
Pareba vesta, Fabricius, local race *vestita*, de Nicéville.
Apatura namouna, Doubleday.
Neptis sankara, Kollar.
Argynnis niphe, Linnæus.
Limenitis danava, Moore, local race *albomarginata*, Weymer.
,, *dudu*, Westwood, local race *bockii*, Moore.
Cyrestis (*Chersonesia*) *risa*, Doubleday and Hewitson, local race *cyanee*, de Nicéville.
Castalius ananda, de Nicéville.
Arrhopala teesta, de Nicéville.
Ilerda epicles, Godart, local race *ila*, de Nicéville.
Rapala schistacea, Moore.
,, *scintilla*, de Nicéville.
Delias belladonna, Fabricius.
Terias libythea, Fabricius.
Huphina nadina, Lucas.
,, *nerissa*, Fabricius, local race *sumatrana*, Hagen.
Papilio cloanthus, Westwood, local race *sumatrana*, Hagen.
,, *payeni*, Boisduval.
Cupitha purreea, Moore.
Halpe zema, Hewitson.

As mentioned above, north-eastern Sumatra does not possess a well-marked dry- and wet-season, such as is found over most of the continent of India, there being no month in the year when it does not rain; indeed it is rare for a week to pass without a shower, consequently there are no dry-season forms of butterflies to be found in Sumatra except the dry-season form of *Melanitis ismene*, Cramer (=*leda*, Linnæus, *auctorum*), which, as also in Java, is found all the year round equally commonly with the wet-season ocellated form, *M. determinata*, Butler.

We would especially bring to notice the occurrence in North-Eastern Sumatra of a very peculiar endemic form of the female of *Papilio memnon*, Linnæus. It belongs to the first form group of females of the species, *i.e.*, the form which has no tail to the hindwing and is most like the male; the second form is also tailless, but has a large white patch on the outer half of the hindwing never found in the first form. This peculiar first form female has the "epaulettes" (*i.e.*, the basal portion of the discoidal cell of the forewing on both surfaces) almost pure white, faintly tinged only with ochreous, so that it may perhaps be called cream-coloured. It probably mimics the second form female of *Papilio forbesi*, Grose Smith, which also possesses similar white epaulettes, the first form lacking them altogether, and is therefore like the male. It may be urged against this theory that females of *P. forbesi* are very rare, especially the white-epauletted second form, Dr. Martin having obtained only two specimens of it. But this scarcity is probably more apparent than real, both sexes of *P. forbesi* occurring in equal numbers, but the males coming down to the hill streams to drink are caught in large numbers, while their less thirsty spouses keep only to the thick forest where they escape the dangers of the butterfly net.

It should be pointed out that de Nicéville is solely responsible for the nomenclature employed in this paper, and for all statements appearing in the first person singular, together with the descriptions of species and sexes; while Martin, who has lived for 13 years in north-east Sumatra, is mainly responsible for the notes on distribution in the island itself, scarcity or rarity, season of occurrence, &c., of the various species; de Nicéville having but twice visited Sumatra, and then only for short periods.

The literature of the subject is of course very scattered and fragmentary. The following is a list of the principal papers dealing with the *Rhopalocera* of Sumatra:—

I. P. C. T. Snellen. Tijd. voor Ent., vol. xx, p. 65 (1877), "*Lepidoptera* op Sumatra verzameld, voornamelijk in Atchin." Enumerates 35 species.

II. Henley Grose Smith. Appendix v of "The Head-Hunters of Borneo" by Carl Bock. English edition, 1881. "List of Sumatra Butterflies." Enumerates 226 species.

III. P. C. T. Snellen, Tijd. voor Ent., vol. xxxiii, p. 215 (1890), "Lijst van *Lepidoptera* op Sumatra." Enumerates 48 species.

IV. Dr. B. Hagen. "Die Pflanzen- und Thierwelt von Deli auf der Ostküste Sumatra's." Separat-Abdruck aus "Tijdschrift van het Koninklijk Nederlandsch Aardrijkskundig Genootschap." Jaargang 1890. Leiden.—E. J. Brill. Enumerates 323 species.

V. P. C. T. Snellen. "Midden-Sumatra." Lepidoptera (1892). Enumerates 104 species.

VI. Dr. B. Hagen. Iris, vol. vii, p. 1 (1894). "Verzeichniss der von mir auf Sumatra gafangenen *Rhopaloceren*." Enumerates 109 species in the subfamilies *Papilioninæ*, *Pierinæ* and *Danainæ* only.

VII. Hofrath Dr. L. Martin. "Einige neue Tagschmetterlinge von Nordost-Sumatra." Munich, 1895. Pts. I and II. Enumerates 9 species.

Besides these papers exclusively on Sumatra butterflies search has been made for all references to the butterflies of the island in Mr. W. F. Kirby's "A Synonymic Catalogue of Diurnal Lepidoptera" up to 1877, and "The Record of the Zoological Literature" up to 1893, the date of the last volume published; Dr. A. R. Wallace's papers on Eastern Butterflies; Mr. A. G. Butler's paper on the Butterflies of Malacca; Dr. O. Staudinger's "Exotische Schmetterlinge," and the Butterflies of Palawan; Herr Georg Semper's "Schmetterlinge der Philippinischen Inseln;" and Mr. W. L. Distant's "Rhopalocera Malayana." It is hoped that the list is fairly complete as far as present knowledge goes. The remarks on each species are headed by the names of the different writers who have recorded the species from Sumatra. All those species that have not been obtained by ourselves have an asterisk (*) prefixed to the name. Dr. Martin is of opinion that this list cannot be greatly extended, and that it is nearly complete. I do not agree with him; up to the last month of his stay in the island, species new to the list continued to be obtained; besides which, considering the vast extent of the island, that it is largely covered with almost impenetrable virgin forest, that a considerable portion of the country has never been explored, that it contains a continuous chain of high volcanic mountains running throughout its entire length which is almost unknown, and has been crossed from north to south in but few places, and finally that Dr. Martin's collectors visited a few favoured spots only, at most 50 miles apart, I think it almost certain that this list will some day be increased by an additional 100 species at least. At the same time we may we think point with some little pride to the fact that it is far larger than any local list which has ever been published except for certain places in Central and South America, containing as it does some 756 species. Next to it probably in size is de Nicéville's "A List of the Butterflies of Sikhim" in the Gazetteer of Sikhim (1894), in which 631 species are enumerated. Synonomy for the commoner and better known species has not been given; but all references to figures of species from Sumatra and lately described species, as well as synonyms of recent date have as far as known been entered.

The imperfections of this list are doubtless many, but we would ask our adverse critics to remember the disadvantages of working in a tropical climate, and also the many letters that have to be written, the number of books to be consulted, the many collectors to be "caught," trained, supplied with necessaries and depatched to the collecting grounds, and the time occupied in preparing and conserving the specimens when obtained, before a list similar to this one can be presented to, let us hope, an indulgent public.

Family NYMPHALIDÆ.

Subfamily DANAINÆ.

1. HESTIA LYNCEUS, Drury.

H. reinwardti, Moore, Proc. Zool. Soc. Lond., 1883, p. 218, n. 3.
H. druyri, l. c., p. 219, n. 6.

Snellen as *linceus* [sic]. Hagen as *lynceus* and *lyncens* [sic]. Grose Smith. Butler. Staudinger. Distant. Moore as *reinwardti* and *druyri*. A common species, occurring from the lower slopes of the mountains to the sea. As usual it is very variable, two of these varieties have been described by Moore as distinct species occurring in Sumatra. The dark variety figured by Distant in Rhop. Malay., pl. i, fig. 2, only comes from places near the mountains and the outer slopes where the rainfall is far heavier than in the plains, while the lighter specimens are found in the forests of the alluvial plain, but the two forms gradually merge the one into the other, and no distinguishing line can be drawn between them. Specimens of the genus *Hestia* are nearly always seen in pairs, and are very fond of flying over the small streams so common in our forests. They never leave the high forest, probably because they have a very weak flight, and their enormous tissue-paper-like wings cannot withstand the wind away from the shelter of the trees.

2. HESTIA BELIA, Westwood.

Hagen as *linteata*. The Sumatran form of this species appears to be nearer to the Javan *H. belia* than to the whiter *H. linteata*, Butler, from the Malay Peninsula, but at best the latter is but a local race of the former. For many years there existed a single specimen in Dr. Martin's collection without locality label, and he nearly despaired of getting it again, when in May, 1894, he obtained all at once in one spot five specimens from Bandar Quala in Serdang, where no specimen of *H. lynceus*, Drury, is ever found, as Mr. Puttfarcken, a very enthusiastic collector of that place, has noted.

3. IDEOPSIS (*Gamana*) DAOS, Boisduval.

Snellen as *Hestia daos*. Hagen as *I. daos*, Horsfield and Moore [sic]. Butler. Staudinger. Distant. Mr. W. F. Kirby, in "Allen's Naturalist's Library. Lepidoptera," vol. i, p. 15 (1894), suggests that the form of this species occurring in Sumatra may be distinct from the typical Bornean form. I possess specimens from both islands, and find that they agree almost exactly. Dr. Staudinger refers to a darker form of the species occurring in Sumatra and Nias. The former is normal; the latter is the *Gamana costalis* of Moore, and is a distinct species. In Sumatra *I. daos* is found not higher than Bekantschan. It is mimicked by a very beautiful day-flying Moth, probably of the genus *Isbarta*, Walker (? *I. glauca*, Walker, from Sumatra), family *Zygænidæ*. On "The Crag" at Penang, 2,000 feet, *I. daos* is very common.

4. DANAIS (*Radena*) VULGARIS, Butler.

Grose Smith. A common species of the plains, the female much rarer than the male. It occurs all the year round, but if there should be a break in the regular rainfall, as there is sometimes in February and March, then only worn specimens are on the wing, shewing that damp weather is necessary for the disclosure of imagines; otherwise generation follows generation regularly throughout the year.

5. *DANAIS (*Radena*) SIMILIS, Linnæus.

Grose Smith. Snellen. Hagen. Mr. Henley Grose Smith is the only writer who gives both *D. vulgaris*, Butler, and *D. similis* from Sumatra. Mr. Moore restricts *D. similis* to Hongkong and Formosa. I greatly doubt its occurrence in Sumatra.

6. *DANAIS (*Radena*) JUVENTA, Cramer.

Moore. Semper from West Sumatra. As it is found in Singapore (*Moore*), Banka, Java, Labuan, Lombok and Billiton, it is possible that it may also occur in Sumatra in the south and west. Banka and Java are only separated from Sumatra by very narrow straits.

7. DANAIS (*Tirumala*) SEPTENTRIONIS, Butler.

Hagen. Quite common in the plains and lower slopes of the hills.

8. *DANAIS (*Tirumala*) LIMNIACE, Cramer.

Hagen. As this species occurs in Burma and the Nicobar Isles, it is possible that it may also be found in Sumatra. However, as Dr. Hagen records in his first paper *D. limniace* and no *D. septentrionis*, and in his second paper *D. septentrionis* and no *D. limniace*, his first identification was probably incorrect.

I wish to take this opportunity to record the occurrence of a butterfly in Malayana which has been well-named in English "The Wanderer," but about whose specific name there has of late years been much contention and confusion. Formerly it was known as *Danais archippus*, Fabricius (1793), then as *Danais (Anosia) plexippus*, Linnæus (1758); recently, however, Mr. W. F. Kirby in "Allen's Naturalist's Library. Lepidoptera," vol. i, pp. 12 and 19 (1894), has pointed out that the *Papilio plexippus* of Linnæus, and the *Papilio archippus* of Cramer [sic, ? Fabricius] cannot apply to this species, and that it should be known as *Danais (Anosia) menippe*, Hübner, described in 1816. But an older name than this last is *Papilio erippus*, Cramer (1775), which should apparently be applied to it, unless *Danais erippus*, described from Brazil, be considered to be a distinct species from *D. menippe*, which, however, Mr. Scudder is not prepared to admit it to be, in which case *D. erippus* must be applied to "The Wanderer." It is certain, however, that *D. erippus* is not the typical form, being in fact a local race of *D. menippe*, so that our species must, as Kirby says, be known as *D. menippe*, Hübner. In my opinion the most accurate nomenclature for the butterfly would be *Danais (Anosia) erippus menippe*, Hübner. At any rate the species here treated has been well figured by Cramer in "Papillons Exotiques" on plate ccvi, figs. E, F (1779), from a female example as *Papilio plexippus*. Mr. W. F. Kirby has already recorded it from Java, I now, for the first time I believe, record it from North Borneo, the late Mr. W. Davison, who was for some years and till his death the Curator of the Raffles Museum, Singapore, having sent me to see a male specimen from that island. The Rev. W. J. Holland, Ph. D., in the Ann. Report Ent. Soc. Ontario for 1893, notes that he has received single specimens of *Danais plexippus*, Linnæus, from Borneo and Java, also its occurrence in the Azores. In Part ii of a new edition of Morris' "A History of British Butterflies," p. 72 (1895), it is stated (though the authority is not given) to have been found in the Andaman Islands. Furthermore, the late Mr. E. F. T. Atkinson in 1889 presented a female specimen of this species to the Indian Museum, Calcutta, which was captured on the 19th April, 1889, by Mr. C. White, the chief officer on board the Peninsular and Oriental S. S. "Ravenna" in the Straits of Malacca (which is at the point where the butterfly was caught only a few miles broad), not far off the island of Pulo Jara between Penang and Singapore. It is therefore not at all improbable that the butterfly flew off from either the adjacent island of Sumatra or from the Asiatic mainland. I have for some years past been looking forward to its capture in India proper, and I think it cannot be long hence before we have evidence of its having established itself on this continent.

P.S.—Since the above was in type, I have lighted on an article in "The Entomologist's Record and Journal of Variation," vol. v, p. 1 (1894), by Dr. F. J. Buckell, entitled "Danais archippus, Anosia plexippus, or What," in which he discusses the question of the correct name by which "The Wanderer" should be known, and arrives at the following conclusions:—

"1.—The balance of argument is against the claim that the American insect is the *plexippus* of Linnæus.

2.—The earliest name given to that species was *erippus*, Cramer, and, if the 'law of priority' is to be pedantically adhered to, this is the trivial name that must be adopted.

3.—The Fabrician name, *archippus*, is that by which the species has been most widely known, and as changes in accustomed nomenclature are to be deprecated, and as, moreover, *erippus*, Cramer, is a varietal form found in Brazil, *archippus* should be retained as the trival name of the species, and *erippus* used as the name of the variety."

As will be seen above, I am unable to follow Dr. Buckell in his conclusions, priority of nomenclature *must* in all cases be strictly maintained.

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9. DANAIS (*Limnas*) CHRYSIPPUS, Linnæus.

Snellen. Hagen. Moore. Found only in the alluvial plain, all the year round, but always very local, and restricted to spots where its food-plant, species of *Calotropis* and *Asclepias*, are found in abundance. There, under a concatination of favourable circumstances, an immense increase of the species, and thousands of specimens, appear. When an over population of this nature occurs, all the food-plants are entirely eaten up by the caterpillars, food gets scarce, and the few butterflies which reach maturity are very small. It takes a long time to recover, and not a single specimen may be seen for a year.

Aberration *alcippus*, Cramer (=*alcippoides*, Moore). Hagen as var. *alcippoides*. Semper as *alcippus* from a small island near Sumatra

(Tijd. voor Ent., vol. xxiii, pp. xiii and xiv (1880). Alphéraky has figured this aberration in Romanoff's "Mémoires sur les Lépidoptères," vol. v, p. 220, pl. xi, fig. 3, *female* (1889), from Teneriffe. Mr. Moore records this "species" from Singapore; it is almost as common as *D. chrysippus* in the plains of Sumatra. I am unable to consider *D. alcippoides*, Moore, Proc. Zool. Soc. Lond., 1883, p. 238, n. 3, pl. xxxi, fig. 1, *male*, as an aberration even to be distinct from the *D. alcippus* of Cramer. It is true that the oblique subapical series of spots on the forewing, especially on the underside, appears to be somewhat broader in Oriental than in African specimens (I have, however, only Cramer's figure of the African form of *D. alcippus* to guide me), but all the other characters given by Mr. Moore to distinguish between the two forms are so obviously variable even in Sumatran specimens that they can have no specific value. I hold that *D. alcippus* is an occasional aberration or "sport" only of *D. chrysippus*, certainly not a distinct species. Dr. Martin during the first years of his residence in Sumatra from 1882 to 1891, as also Dr. Hagen, never saw *D. alcippus*, the first specimens appearing in 1892 near Selesseh, immigrating into Deli from the north-west. Since that year the true *D. chrysippus* has become rarer and rarer, and the aberrational form has become more and more common.

10. DANAIS (*Salatura*) INTERMEDIA, Moore.

Salatura sumatrana, Moore, Proc. Zool. Soc. Lond., 1883, p. 242, n. 8.

Moore as *sumatrana*. Hagen as *genutia*. Very common in the plains of Sumatra. It is, I think, a very remarkable fact that *D. plexippus*, Linnæus,* which is a common species in the Malay Peninsula, should not be found in Sumatra, but be replaced by *D. intermedia*, which latter in the Malay Peninsula is probably only an aberration or "sport" of *D. plexippus*, but has become fixed as a distinct species in Sumatra. In my collection from the Asiatic mainland I have every gradation between typical *D. plexippus* and *D. intermedia*. I am quite unable to find any character by which to separate *D. sumatrana*, Moore, from *D. intermedia*, Moore.

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* Mr. W. F. Kirby has recently shewn in "Allen's Naturalist's Library. Lepidoptera," vol. i, p. 19, pl. v, fig. 1, *male* (1894), that the butterfly which has for the last fifteen years or so gone under the name of *Danais genutia*, Cramer (1779), must revert to the name by which it was previously almost universally known, *viz.*, *Danais plexippus*, Linnæus (1758), which latter was described as having a white band on the forewing like *D. chrysippus*, Linnæus, a character not found in any American species of *Danais*, *D. plexippus* having been originally erroneously described from America.

11. DANAIS (*Salatura*) HEGESIPPUS, Cramer.

Snellen as *hegesippus* and as *melanippus*, the latter being a distinct local race from Java. Hagen as *melanippus*, var. *hegesippus*. Butler as *melanippus*. Distant as *melanippus*, var. *hegesippus*. It was figured by Cramer from a female specimen from the west coast of Sumatra. *D. intermedia*, Moore, is found in the smaller hills bordering the alluvial plain, and is still to be got at Bekantschan, whereas *D. hegesippus* is always found within a moderate distance of the sea. On the islands of Penang, Singapore and Riau (the latter belonging to the Dutch) *D. hegesippus* occurs commonly, while *D. intermedia* is decidedly rarer, or wanting altogether.

12. DANAIS (*Bahora*) ASPASIA, Fabricius.

Hagen as *crocea*; also as *aspasia*, var. *crocea*. Staudinger. Distant as *aspasia*, var. *crocea*. I am quite unable to separate *D. crocea*, Butler, from *D. aspasia*, *vide* Journ. Bomb. Nat. Hist. Soc., vol. x, p. 13, (1895). I have a large series of these two supposed distinct species from the typical localities for each, and they are absolutely indistinguishable. *D. aspasia* may be found in Sumatra all the year round, but always only singly. In the spots where a blue Heliotrope-like flower is in abundance, the males of this species will occur singly together with numerous species of *Danais* and *Euplœa*, but the females are only found in the forests, and never frequent these well-beloved flowers of their husbands, brothers and cousins.

13. DANAIS (*Parantica*) AGLAIOIDES, Felder.

Hagen as *agleoides* [sic]. Grose Smith as *agleoides* [sic]. Staudinger as *agleoides* [sic]. Distant as *agleoides* [sic]. The males are very common in the plains, the females very rare as in the case of *D. vulgaris*, Butler. On the wing these two species are hardly distinguishable.

14. * DANAIS (*Parantica*) GRAMMICA, Boisduval.

Grose Smith. Dr. Martin has never met with this species. Mr. Moore restricts it to Java, but it may quite possibly occur at the south-east end of Sumatra, which is only separated from Java by the very narrow Sunda Strait. It is known to me by Boisduval's figure only.

15. DANAIS (*Caduga*) TYTIOÏDES, de Nicéville.

D. melaneus, Cramer, var. *tityoides* [sic], Hagen, Die Pflanzen- und Thierwelt von Deli auf der ostküste Sumatra's, p. 192, n. 5 (1890).

D. (*Caduga*) *tytioides*, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. viii, p. 37, n. 1, pl. K, figs. 1, *male*; 2, *female* (1893).

Hagen. Occurs somewhat rarely only on the Central Plateau and not below 3,000 feet elevation, not even being found at Bekantschan. As Dr. Hagen wrongly diagnosed this species by making it a "variety" of *D. melaneus*, Cramer, which it certainly is not, seeing that it is a local race of *D. tytia*, Gray; as moreover, he spelt the name incorrectly, I refuse to accept his name for the species, though it is prior to mine. In all cases where a species has been first described incorrectly as a "variety" of another species, and is subsequently proved to be a distinct species, it is optional for the author who so proves it to be distinct to use the varietal name so given to it in a full specific sense, or to rename it altogether.

16. DANAIS (*Caduga*) BANKSII, Moore.

Caduga banksii, Moore, Proc. Zool. Soc. Lond., 1883, p. 251, n. 8.

Moore. Grose Smith as *melaneus*, Cramer. Semper as *aglea*, Cramer. Hagen as *aglea* and *melaneus*. It is a good local race of *D. melaneus*, Cramer, from the eastern Himalayas, Assam, Burma, and the Malay Peninsula. Occurs on the Central Plateau and higher hills as also in the plains, the specimens from the highest points being richer and darker in colour than those from a lower elevation.

17. * EUPLŒA (*Menama*) BUXTONI, Moore.

Menama buxtoni, Moore, Proc. Zool. Soc. Lond., 1883, p. 265, n. 5.

Moore. Originally described from Sumatra. Dr. Martin has not met with any species of this distinct subgenus in Sumatra.

18. * EUPLŒA (*Menama*) MODESTA, Butler.

Grose Smith. Originally described from Siam. It is more than doubtful if two species of the subgenus *Menama* occur in Sumatra. Dr. Hagen records quite funnily "*Menama* species near *loeza*." He does not appear to know that *Menama* is a genus of Mr. Moore's, he treats the name as specific. The species "*loeza*" is probably intended to mean *Menama lorzæ*, Moore, Proc. Zool. Soc. Lond., 1883, p. 265, n. 6, pl. xxxi, fig. 5, *male*, from Sandakan, North Borneo.

19. EUPLŒA (*Tronga*) BREMERI, Felder.

Hagen. Butler. A common species in the plains and occurs also in the lower ranges of the mountains up to 1,500 feet elevation. In December, 1894, and January, 1895, Dr. Martin obtained hundreds of specimens from Kepras, a village on the boundary between Langkat and the independent Battak country. The female is always somewhat scarce. It may be of interest to note that out of large numbers of butterflies of this species there are always to be found a few males which have on the upperside of the forewing a short and sometimes even a quite distinct and longer "male-mark." The genus *Tronga* comes into Mr. Moore's group A of the *Euplœina*, which is defined as having "No 'sexual-mark' or scent-producing organ on forewing." But there are many exceptions to this definition.

20. EUPLŒA (*Tronga*) MOOREI, Butler.

Butler. Kirby. Moore. This species may be distinguished from *E. bremeri*, Felder, by its smaller size, the duller colour of the upperside of both wings, being brown, not black, with all the white spots smaller. It never shews any traces of a "male-mark." It occurs in the plains about equally commonly as *E. bremeri*, though it is found also at somewhat greater elevations in the hills, occurring even on the Central Plateau; these latter specimens show only very few white spots.

21. * EUPLŒA (*Tronga*) HEYLÆRTSII, Moore.

Tronga heylærtsii, Moore, Lep. Ind., vol. i, p. 79 (1890).

Moore. Described from Sumatra, but we have failed to recognise it.

22. EUPLŒA (*Adigama*) MALAYICA, Butler.

Euplœa ochsenheimeri, Lucas, Snellen, Midden-Sumatra, Lepidoptera, p. 12, n. 1, pl. ii, figs. 1, 2, *male* (1892).

Grose Smith as *ochsenheimeieri* [sic]. Moore. Snellen as *ochsenheimeri*, Lucas. Hagen as *ochsenheimeri*, Butler and Lucas. Staudinger. Distant. This beautiful and large species is found only in the deep forests of the plains, never higher than Namoe Oekor. It flies mostly alone high over the small openings in the evergreen forests, and is found all the year round, but never in large numbers. There has been much confusion regarding the name *Euplœa ochsenheimeri*. Two species have been so called, one by Lucas in 1853, and one by Moore in 1857, both from Java. Mr. Moore places his own species in the genus *Adigama*, and Lucas' in *Tirona*. There has been no *Euplœa* named *ochsenheimeri* by Butler, as stated by Dr. Hagen. To further complicate matters, Snellen figures *E. malayica*, Butler, as *E. ochsenheimeri*, Lucas, with which it has nothing whatever in common.

23. *EUPLŒA (*Andasena*) BELINDA, Butler.

Euplœa belinda, Butler, Journ. Linn. Soc. Lond., Zoology, vol. xiv, p. 299, n. 2 (1878).

Butler. Moore. Originally described from Sumatra. We have seen no *Euplœa* from Sumatra belonging to the subgenus *Andasena*.

24. *EUPLŒA (*Andasena*) OROPE, Boisduval.

Kirby. Butler as a var. with a query, from Sumatra. Originally described from Taïti, recorded from Timor by Butler. Very doubtfully Sumatran.

25. *EUPLŒA (*Betanga*) SCHERZERI, Felder.

Kirby. Originally described from Ceylon. Entirely unknown to us.

26. EUPLŒA (*Penoa*) MENETRIESII, Felder.

Grose Smith. Hagen. Distant. Not very common. Found in the plains and also on the outer hills as high as Bekautschan. The female is much rarer than the male, and often shews a white spot in the discoidal cell of the forewing on the upperside. It has in the male a much smaller "male-mark" than *E. pinwillii*, Butler.

27. EUPLŒA (*Penoa*) PINWILLII, Butler.

Hagen as *pinwilli*, Godardt [sic]. Staudinger. Is very common everywhere at low elevations, and especially frequents the above-mentioned Heliotrope-like flowers. The female is of course much rarer than the male, and possesses a violet gloss to both wings on the upperside, which the female of *E. ménétriésii*, Felder, never has. It has in the male a much larger "male-mark" than in *E. ménétriésii*.

28. *EUPLŒA (*Crastia*) CORE, Cramer.

A single female recorded from Sumatra by Snellen, the specimen being probably some species of *Tronga*. *E. core* is practically confined to the continent of India.

29. EUPLŒA (*Crastia*) DISTANTII, Moore.

Crastia distantii, Moore, Ann. and Mag. of Nat. Hist., fifth series, vol. ix, p. 453 (1882).

Euplœa distanti, Distant, Rhop. Malay., p. 32, n. 13, pl. v, fig. 9, *male* (1882).

Crastia distanti, Moore, Proc. Zool. Soc. Lond., 1883, p. 278, n. 5, pl. xxix, fig. 6, *male*.

Moore. Hagen as *distanti* [sic]. Distant as *distanti* [sic]. Originally described from Sumatra. Never found at the higher elevations in the hills, and is more plentiful near the sea; especially so in both sexes on both sides of the Wampoe River near the village of Stabat. It is the commonest of the brown *Euplœas* in our area. Both sexes exhibit very many variations in the shade of the brown colour of both wings. The male has sometimes absolutely no "male-mark" as should be exhibited according to Mr. Moore's definition of his group A; there is sometimes a small one on the upperside of the forewing in the submedian interspace; sometimes there is a large narrow mark; sometimes a large broad mark as in Mr. Moore's group B. In some hundreds of specimens which I have examined I have found every intergrade between these four forms, which goes to prove that in some groups of *Euplœas* the "male-marks" cannot be used in even a subgeneric sense. Dr. Hagen as late as 1889 noted that *E. distantii* is everywhere very common around the feet of the traveller. It may here be mentioned that all the brown *Euplœas*:—*bremeri*, *moorei*, *distantii* and *ægyptus* (which follows) were all more or less plentiful in Deli so long as there were forests. But owing to the cultivation of tobacco all the forests have been cut down, the brown *Euplœas* have become rarer and rarer in the true tobacco districts, but may still be found as plentifully as in former years only on the boundaries of Deli, Langkat and Serdang, where again the forests commence. Even *E. distantii* is now decidedly rare in Deli and Langkat proper.

30. *EUPLŒA (*Crastia*) INCONSPICUA, Moore.

Crastia inconspicua, Moore, Proc. Zool. Soc. Lond., 1883, p. 279, n. 10.

Moore. Originally described from Sumatra. Unknown to us.

31. *EUPLŒA (*Crastia*) AMYMONE, Godart.

Danais amymone, Godart, Enc. Méth., vol. ix, p. 179, n. 11 (1819).
Crastia amymone, Moore, Proc. Zool. Soc. Lond., 1883, p. 279, n. 13.

Butler. Moore. Described by Godart from Amboina, recorded from China and Cochin China by Moore. Unknown to us.

32. *EUPLŒA (*Crastia*) FELDERI, Butler.

Euplœa felderi, Butler, Proc. Zool. Soc. Lond., 1866, p. 275, n. 20.

Butler. The type (a female) was from Sumatra. Recorded from Hong Kong by Moore. Unknown to us.

33. EUPLŒA (*Trepsichrois*) LINNÆI, Moore.

Trepsichrois van-deventeri, Forbes, A Naturalist's Wanderings, p. 274 (1885).

Forbes as *van-deventeri*. Grose Smith as *midamus*. Snellen as *midamus*. Hagen as *midamus*. Hagen also gives "var. *mulciber*, Distant [sic]. Butler as *midamus*. Staudinger as *midamus*. Distant as *midamus*. Moore. The commonest species of *Euplœa* both in the plains and hills in Sumatra. It is found all the year round and always in fresh generations. Of all the species of *Euplœa* it is the most mimicked, in the female by the female of *Elymnias laisidis*, de Nicéville; in the male by the third form of the female of *Euripus halitherses*, Doubleday and Hewitson; in the male by the first form of the female of *Hypolimnas anomala*, Wallace; also *Papilio butleri*, Janson, in both sexes mimicks both sexes of this *Euplœa*. The scent of *Euplœa linnæi* reminds Dr. Martin of "Worcester Sauce." The males are variable; in one variety the spots on the upperside of the forewing are violet, in another they are white. These latter specimens would appear to agree with *E. mulciber*, Cramer, described by him from China and the Coromandel Coast (the latter locality is certainly erroneous), but restricted by Moore to the islands of Borneo and Billiton. My male specimens of *Trepsichrois* from Borneo do not at all agree with Cramer's figure of "*Papilio*" *mulciber*, having the spots on the upperside of the forewing very small (much smaller than in typical *E. linnæi*) and violet, instead of large and white as portrayed by Cramer.

34. EUPLŒA CASTELNAUI, Felder.

Hagen. Never occurs in Deli, Langkat and Serdang, all the specimens from Sumatra—about a dozen—in Dr. Martin's collection were caught by his brother, Dr. Friedl Martin, in Asahan, south of our area; still further south of Asahan, at Indragiri, where Dr. F. Martin also collected, he failed to get *E. castelnaui*. At Penang it occurs close to the sea-shore, but it flies high and is not easily caught. It is always solitary, several specimens are never seen together.

35. EUPLŒA (*Calliplœa*) EUNUS, de Nicéville, n. sp.

Grose Smith as *ledereri* and *mazares*. Hagen as *ledereri*. Moore as *ledereri*. Staudinger as *mazares*.

HABITAT: N.-E. Sumatra.

EXPANSE: ♂, 2·5 to 2·9; ♀, 2·7 to 3·0 inches.

DESCRIPTION: MALE and FEMALE. Allied to *E.* (*Calliplœa*) *mazares*, Moore, from Java, but differing therefrom in having the UPPERSIDE of *both wings* almost entirely unglossed with purple, while that species has the anterior two-thirds of the forewing and a small patch in the middle of the hindwing purple-glossed; the white, violet-glossed spots on both wings the same.

E. eunus, de Nicéville, from Sumatra, *E. mazares*, Moore, from Java, *E. ledereri*, Felder, from the Malay Peninsula, and *E. aristotelis*, Moore, from Borneo, can be arranged in a regular series by the extent of the purple-glossing of both wings on the upperside, *E. eunus* being the least, *E. aristotelis* the most purple-glossed; the latter, indeed, if I have correctly identified it, having the whole of the forewing and a considerable area on the hindwing very rich iridescent purple.

This species is never found at high elevations, not even as high as Bindjei, but always close to the sea. It is very plentiful on the river banks of the Wampoe near Kampong Inei and Stabat, and is found in company with *Danais hegesippus*, Cramer, and *Euplœa distantii*, Moore, the *Danainæ* of the lowest elevations For twelve years Dr. Martin did not succeed in obtaining a female, only in the last two years were females found in considerable numbers by the imported Lepcha collectors from India, but that sex is always much rarer than the male.

36. EUPLŒA (*Danisepa*) DIOCLETIANUS, Fabricius.

Grose Smith as *rhadamanthus*. Snellen as *radamanthus* [sic], and *rhadamanthus*. Hagen as *diochtianus* [sic], and *rhadamanthus*, Horsfield [sic]. Staudinger as *rhadamanthus*. Distant. Moore. Mr. Moore has recently shewn that Fabricius described "*Papilio*" *diocletianus* from a female, and "*Papilio*" *rhadamanthus* from a male of the same species, so the earlier name applied to the species is here used irrespective of the sex. Is rather a common species in the plains, and occurs in the outer hills as high as Bekantschan; the female is always much rarer than the male. The male is mimicked by *Papilio velutinus*, Butler, and also by the first and second forms of *Euripus halitherses*, Doubleday and Hewitson.

37. *EUPLŒA (*Selinda*) ELEUSINA, Cramer.

Snellen records a single male from Sumatra. But for this solitary identification the species has always been considered to be confined to Java.

38. EUPLŒA (*Salpinx*) LEUCOSTICTOS, Gmelin.

Grose Smith as *novaræ*. Hagen as *novaræ*. Butler as *vestigiata*. Distant as *vestigiata*. Very rare in Sumatra, perhaps commoner in Java than elsewhere. I have during many years past added to my collection every specimen of this group of *Euplœa* I could obtain, and now that I have very extensive material to compare, I find that it is quite impossible to separate *E. leucostictos*, described in 1789, *E. dehaani*, Lucas (1853), *E. novaræ*, Felder (1862), *E. vestigiata*, Butler (1866), *E. leucogonys*, Butler (1879), and *E. lazulina*, Moore (1883). The species is obviously a variable one, the variations which it exhibits are not confined to particular localities, but are shewn wherever it is found. Mr. Moore in Proc. Zool. Soc. Lond., 1883, restricts *E. novaræ* to the Nicobar Isles and Tenasserim, *E. vestigiata* to Sumatra, *E. lazulina* to Malacca, *E. leucogonys* to Malacca, *E. leucostictos* to Java, and *E. dehaani* to Java. All *Euplœas* in Sumatra, both the brown and blue ones, even the rare *E. leucostictos*, are exceedingly fond of spots where there is shade from the direct sunlight, especially where there is dead wood, so that they may frequently be found in the open verandahs of houses near the forest, or on wooden bridges over rivers, which in Sumatra are almost always furnished with an attap roof made of palm leaves to protect the woodwork from the rain. To these places do the *Euplœas* resort, for a short time emerging into the sunlight and exhibiting their lovely iridescent colours, then returning to the favourite spot on wood, where they rest with folded wings; this evidently much-enjoyed sport of the butterflies continuing the whole day till three or four o'clock in the afternoon, when the lengthening shadows warn them that it is time to retire to their resting places in the adjoining forest, where they spend the night. It was on one of these wooden bridges that Dr. Martin obtained his first *E. leucostictos*.

39. *EUPLŒA (*Isamia*) CHLOE, Guérin.

Distant. Butler.

40. *EUPLŒA (*Isamia*) DEJEANI, Distant.

Distant. Moore. Mr. Distant expresses the opinion that this species "May be but an extreme variety of *E. chloë*," Guérin, which latter by Mr. Moore is restricted to Province Wellesley in the Malay Peninsula. I am also of this opinion, but keep it distinct for the present, as I have seen no specimen agreeing exactly with Mr. Distant's figure and description of *E. dejeani*.

41. *EUPLŒA (*Isamia*) SOPHIA, Moore.

Originally described from Sumatra by Moore.

42. EUPLŒA (*Isamia*) ÆGYPTUS, Butler.

E. ægyptus, Snellen, Midden-Sumatra, Lepidoptera, p. 12, n. 2, pl. i, figs. 1-3, *male* (1892).

Grose Smith. Snellen. Hagen. Kirby. Moore. A rather rare species in the plains, and found on the lower slopes of the hills as high as Bekantschan. The female is excessively rare. I have retained this name for the species of *Isamia* (I have been able to recognise only one) occurring in Sumatra, as so many authors have identified the Sumatran form of *E. chloë*, Guérin (which is the oldest name for the species of this group) under it. But I am very strongly of opinion that instead of four species of *Isamia* as recorded above occurring in Sumatra there is only one, and moreover, that several other species kept separate by Mr. Moore should be added to the synonymy.

43. *EUPLŒA (*Narmada*) CONSIMILIS, Felder.

Moore. Originally described from Java. Unknown to us from Sumatra.

44. EUPLŒA (*Narmada*) MARTINII, de Nicéville.

E. (*Narmada*) *martinii*, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. viii, p. 38, n. 2, pl. K, figs. 3, *male*; 4, *female* (1893).

Not uncommon in the higher mountains and on the Central Plateau, but never below 3,000 feet elevation. In this species both sexes were almost always brought in equal numbers. It is almost unrivalled in the male in the rich velvety deep black coloration of its upperside.

45. EUPLŒA (*Stictoplœa*) HARRISII, Felder.

Grose Smith as *tyrianthina*. Hagen as *thyriantina* [sic]. Moore as *tyrianthina*. As I can exactly match Sumatran specimens of *E. tyrianthina*, Moore, with Khasi Hill examples of *E. harrisii*, Felder, I record the species under the latter name, as it is much the older. *E. harrisii* is richly blue-glossed, in spite of Mr. Moore having stated the contrary in Lepidoptera Indica, vol. i, p. 138 (1891). In Sumatra it is, as this species goes, fairly constant, though the spots on both wings as usual shew considerable variation both as to size and number. I possess some which coincide precisely, spot for spot, and in the extent of the blue coloration, with Mr. Moore's figure of *Stictoplœa crowleyi* (l.c., pl. lii, fig. 2, *male*). For notes on the variability and synonomy of *E. harrisii*, see de Nicéville, Proceedings Asiatic Society Bengal, 1892, n. 158. In Sumatra it is found in the alluvial plain and also as high as Bekantschan and Kepras in the hills. The female is as usual very rare. Dr. Martin caught his first male specimen under the roof of a wooden bridge over the Bindjei river near Namoe Oekor.

46. *EUPLŒA (*Stictoplœa*) PICINA, Butler.

E. picina, Butler, Proc. Zool. Soc. Lond., 1866, p. 280, n. 36, pl. xxx, fig. 1, *male*.

Butler. Moore. Originally described from Sumatra. Unknown to us.

47. *EUPLŒA (*Stictoplœa*) INCONSPICUA, Butler.

Butler. Moore. Originally described from Sumatra. Unknown to us.

Subfamily SATYRINÆ.

48. MYCALESIS (*Satoa*) MAIA, de Nicéville.

M. (*Satoa*) *maia*, de Nicéville, Journ. A. S. B., vol. lxiii, pt. 2, p. 1, n. 1, pl. i, figs. 1, *male*; 2, *female* (1894).

Grose Smith as *maianeas*. Snellen as *majaneas* [sic]. Hagen as *maianeas*. Occurs only in the large forest, and never at low elevations, its region commencing at Namoe Oekor and thence into the hills. It is always found on or very near to the ground. Very easily damaged, hardly ever is a perfect specimen obtained.

49. *MYCALESIS (*Dalapa*) SUDRA, Felder.

Moore. Not rare in Java, unknown to us from Sumatra.

50. MYCALESIS (*Suralaya*) ORSEIS, Hewitson.

Grose Smith. Hagen. Snellen. Kirby. Distant. Also a true butterfly of the high forest, and is the only Sumatran *Mycalesis* which has a bluish gloss on the upperside of the wings as so many forest butterflies have in a greater or less degree, such as the *Cœlites*, *Thaumantis*, *Amathuxidia dilucida*, Honrath, and others; even the *Lampides* of the forest, *L. saturata*, Snellen, *L. elpis*, Godart, and *L. subdita*, Moore, are far richer and deeper blue than the *Lampides celeno*, Cramer, of the roads.

51. MYCALESIS (*Orsotriæna*) MEDUS, Fabricius.

Hewitson as *hesione*. Snellen as *hesione*. Grose Smith as *hesione*. Hagen. Distant. Very common in the plains. The dry-season form of the species found in many parts of India, *M. runeka*, Moore, is quite unknown in Sumatra. Dr. Martin has bred it in Sumatra on grass, from eggs laid by females shut up in glass prune bottles. He considers that *Orsotriæna* should be used in its full generic sense, as the larva and and pupa differ greatly from the larvæ and pupæ of species of *Calysisme* and *Mydosama* which he has also bred from the egg laid in confinement, the larvæ of these subgenera also feeding on various species of grass. *M. medus* in Sumatra occurs all the year round, generation following generation in rapid succession. Dr. Martin notes that "The ocelli on the underside of the wings possess in this species a quite peculiar glossy surrounding, which I know to occur only in the Indian genus *Zipætes*, Hewitson."

52. MYCALESIS (*Calysisme*) PERSEUS, Fabricius.

Grose Smith as *samba* and *lalassis*. Hagen as *blasius*, var. *lalassis*, Hewitson. *M. blasius* is the wet-season, and *M. perseus* the dry-season form of one and the same species; the latter is not found in Sumatra. *M. lalassis* is confined to Gilolo and Amboina according to Mr. Moore. Not uncommon in the plains, but occurs less frequently than *M. mineus*, Linnæus, and *M. horsfieldii*, Moore.

53. *MYCALESIS (*Calysisme*) POLYDECTA, Cramer.

Snellen as *justina*. Butler. Mr. Moore gives the "*Papilio*" *justina*, Cramer, which was described from the Coromandel Coast of South India, as a synonym of *M. polydecta*, and restricts the species to Eastern, Central, and Southern India, and Ceylon. As the figure of *M. justina* is very similar to the wet-season form of *M. mineus*, Linnæus, while the figure of *M. polydecta* reminds one at once of the recently-described *M. horsfieldii*, Moore, it is, I think, probable that Messrs. Snellen and Butler have incorrectly recorded this species from Sumatra. Dr. Hagen gives *M. justina* as a synonym of *M. mineus*.

54. MYCALESIS (*Calysisme*) MINEUS, Linnæus.

Hewitson. Grose Smith as *ostrea*. Hagen as *drusia*, and as *mineus*, Butler [sic]. Distant. Mr. Moore considers that both *M. mineus* and *M. drusia*, Cramer, represent the wet-season form of one and the same species. No dry-season form of it (*M. otrea*, Cramer, *nec M. ostrea*, Westwood, which also equals the dry-season form of *M. mineus*), occurs in Sumatra. It is the commonest species of *Mycalesis* found in the island, and flies everywhere with *M. medus*, Fabricius, where there is grass and a little jungle for it to retire into.

55. MYCALESIS (*Calysisme*) HORSFIELDII, Moore.

Calysisme horsfieldii, Moore, Lep. Ind., vol. i, p. 197, pl. lxvi, figs. 2, 2*a*, 2*b*, *male, wet-season form*; 2*c*, *dry-season form* (1892).

The dry- and wet-season forms of this species differ but little. I have specimens also from Nias Island and Java. *M. mineus*, Linnæus, *M. perseus*, Fabricius, and *M. horsfieldii* all occur at the same time and place, so there can be no question of one being perhaps a seasonal form of the other. Besides, the "male-marks" of the three species differ considerably, that of the latter on the upperside of the hindwing being very much larger than those of the other two species. Dr. Martin has bred this species as well as *M. mineus*, *M. janardana*, Moore, and *M. anapita*, Moore, from eggs laid by confined females; the larval stage of all four being very similar and not easy to be differentiated, if mixed together. *M. horsfieldii* and *M. anapita* would not eat the common ubiquitous *Gramineæ*, so he had to give them other and rarer kinds of grass. *M. horsfieldii* is common in the plains of Sumatra, the female rarer than the male.

56. MYCALESIS (*Culapa*) MNASICLES, Hewitson.

M. mnasicles, Hewitson, Ex. Butt., vol. iii, pl. *Mycalesis* v, figs. 32, 33, *male* (1864).

Hewitson. Grose Smith. Hagen as *muasicles* [sic]. Distant. Kirby. Originally described from Sumatra. Rather rare in the forests and in pepper gardens; not found at so low an elevation even as Namoe Oekor, somewhat plentiful at Loeu Boentoe near the Battak frontier. This species is the largest of all the Sumatran *Mycalesis*, and small males only may be equalled in size by very large females of *M. mineus*, Linnæus, or *M. orseis*, Hewitson. The shape of the forewing also is very different from all our other species of the genus.

57. MYCALESIS (*Martanda*) JANARDANA, Moore.

Grose Smith. Snellen. Hagen. Distant. Occurs not uncommonly in the forests of the plains. The large deep velvety black spot — which is a "male-mark"—in and around the discoidal cell of the forewing on the upperside of the male, and the mottled underside of both wings makes this species of easy recognition. The caterpillars feed only at night. The butterfly emerges from the pupa very late in the day, not before two or three o'clock P. M., all the other species bred by Dr. Martin emerged between nine and ten o'clock A.M. It flies mostly at dawn and the dusk of the evening, and is a good example of the crepuscular habits of so many tropical butterflies.

58. *MYCALESIS (*Martanda*) MEGAMEDE, Hewitson.

Hewitson. Grose Smith. Originally described from Ternate; Hewitson records it from Macassar in Celebes, Gilolo, Batchian, Ternate, Sumatra, Malacca and Java; Moore records it from Celebes, Gilolo and Batchian. It is unknown to us.

59. MYCALESIS (*Mydosama*) FUSCUM, Felder.

Hewitson as *diniche*. Snellen. Grose Smith as *diniche* twice over. Hagen. Distant as *fusca* [sic]. Common in the forests at the foot of the hills and also in the plains, near rivers, and at Stabat. In coloration it is intermediate between the fuscous and yellow species of *Mycalesis*.

60. MYCALESIS (*Mydosama*) ANAPITA, Moore.

Hewitson. Grose Smith. Snellen. Hagen. Common in the forests of the plains.

61. MYCALESIS (*Mydosama*) MARGINATA, Moore.

Mydosama marginata, Moore, Trans. Ent. Soc. Lond., 1881, p. 307.

Moore. Hagen. Originally described from Sumatra. Occurs only on the Central Plateau at an elevation of not less than 3,000 feet at least. It is quite common where it is found, and is endemic to the Battak mountains.

62. MYCALESIS (*Mydosama*) DOHERTYI, Elwes.

M. dohertyi, Elwes, Proc. Zool. Soc. Lond., 1891, p. 261, pl. xxvii, figs. 3, *male*; 4, *female*.

Described from Perak in the Malay Peninsula. Dr. Martin obtained a single male from Selesseh, and later a female from Soekaranda, and in 1894 one pair from Bekantschan. It is one of the rarest butterflies in Sumatra, as in thirteen years' collecting he only obtained these four specimens.

63. *MYCALESIS (*Mydosama*) ASOPHIS, Hewitson.

Grose Smith. Originally described from Mysol. Recorded also from New Guinea, Waigiou and Ternate by Moore. Unknown to us.

64. MYCALESIS (*Loësa*) OROATIS, Hewitson.

Hagen as *oroatis* and *ustulata*. Mr. F. Moore allows *L. surkha*, Marshall, to stand for this species, in preference to *L. fervida*, Butler, which is an older name, being the first published. Colonel Marshall's description of *M. surkha* was read before Mr. Butler's paper was published, but that does not give priority. *M. fervida*, *M. surkha* and *M. ustulata*, Distant, are all synonyms of *M. oroatis*, described from Java. The first two names represent dry-season, the last two wet-season forms of one and the same species. The dry-season form certainly does not occur in Sumatra, it is unknown to me if it is found in Java. *M. oroatis* is somewhat uncommon in the lower hills at Namoe Oekor, Namoe Tambis, and Bekantschan. It is the darkest of the yellow species of *Mycalesis* found in Sumatra. Females are rare.

65. *MYCALESIS MEDUSA.

Grose Smith. This species does not appear to have ever been described.

66. *MYCALESIS BOCKII.

Grose Smith. Also apparently nondescript.

It may perhaps be here noted that all the Sumatran species of *Mycalesis* are very earth-loving insects, they always keep close to the ground, which they only leave for higher flights on two occasions, *viz.*, during the wedding flight, and when two jealous males meet and fight. *Mycalesis* are out on rainy days when there is no sun, and give on such days some occupation and consolation to the otherwise disappointed collector. All the species are very fond of fæces of all kinds and of sweets, and are often very numerous on pieces of sugar-cane which the natives have thrown away after removing all the sweet juice possible by mastication or otherwise. They are also very partial to the red saliva of the betel-chewing natives.

67. NEORINA LOWII, Doubleday and Hewitson.

Hewitson as *Cyllo lowii.* Grose Smith. Snellen as *Hipio lowii.* Hagen as *Hipio lowii.* Staudinger. Distant. Kirby. Occurs only in the lower hills and is not very common, and when caught is nearly always in a damaged condition. They are very fond of the juice of some forest trees, which give forth this liquid when the bark is cut or wounded. Every observer who has seen it flying has noted its strong likeness to *Papilio helenus*, Linnæus. This, however, is not a case of mimicry but of accidental resemblance only, as *P. helenus* is not a protected butterfly. Dr. Martin considers that in its shape and habits it is very near to the genus *Melanitis*, being only a gigantic form of the genus.

68. AMNOSIA EUDAMIA, Grose Smith.

A. eudamia, Grose Smith, Nat. Wand. East. Arch., p. 275 (1885).
A. martini, Honrath, Berl. Ent Zeit., vol. xxxvi, p. 439 (1891).

Grose Smith as *decora* and *eudamia*. Snellen as *decora*. Hagen as *decora*. The late Professor Westwood originally described the genus *Amnosia*, and placed it in the subfamily *Nymphalinæ* immediately before *Cyrestis*. Kirby and Staudinger retain it in the same position. The late Dr. Schatz placed it between *Stibochiona* and *Hestina*. Dr. Hagen has struck out an independent course, and places it in the subfamily *Amathusiinæ*, between *Enispe* and *Clerome*. I am of opinion that it should come into the subfamily *Satyrinæ* near to the genus *Neorina*. The presence of ocelli in the subfamily *Nymphalinæ* is rare, and when found in such genera as *Precis*, *Junonia*, *Apatura*, *Cynthia*, *Rhinopalpa*, *Doleschallia*, *Kallima*, &c., differ in character from the ocelli found in the *Satyrinæ*. The yellow form of female of *A. eudamia* agrees strikingly in shape, facies, and its naked eyes with *Neorina hilda*, Westwood, the type of the genus, having the veins of the forewing non-swollen at the base, and a broad oblique yellow band across the disc of that wing. In these features it also strongly resembles *Melanitis amabilis*, Boisduval, from New Guinea. *Amnosia* differs from *Melanitis*, however, in having the second median nervule of the hindwing arising at the end of the discoidal cell, instead of well before the end; in this it agrees with *Neorina*. *Amnosia* differs from *Neorina* in the direction of the disco-cellular nervules of the forewing; and in having the second median nervule of that wing arising at the lower end of the cell instead of long before the end. All the genera of the *Amathusiinæ* have to my eyes a facies peculiar to themselves not seen in *Amnosia*; besides which in all the genera except *Xanthotænia* the discoidal cell of the hindwing is open or only partially closed, in the *Satyrinæ* it is closed entirely, *Amnosia* therein agreeing with the latter. The genus at present contains four species, *A. decora*, Doubleday and Hewitson, from Java, *A. eudamia*, Grose Smith, from Sumatra, *A. baluana*, Fruhstorfer, from North Borneo, and *A. decorina*, Fruhstorfer, from Nias. The male of *A. eudamia* differs from that sex of *A. decora* in having the oblique blue band on the upperside of the forewing broader, paler, and of a more silvery hue. The female of *A. eudamia* is dimorphic, one form having the band yellow, the other having it white; specimens somewhat intermediate between these two forms, the band being yellowish-white, are sometimes obtained. Dr. Martin informs me that he has received both forms of *A. decora* from Java also. He took the first white females of *A. eudamia* ever obtained to Europe in 1889, from them the late Herr Honrath created the species *Amnosia martini*, not being aware that Mr. Henley Grose Smith had already described the species from specimens obtained by Mr. Henry O. Forbes. Dr. Martin captured his first specimens himself in 1889 in Deli, south of Kampong Roemah Kenangkong. It occurs also in the forests at high elevations south of Bekantschan, in the Battak mountains, and on the Central Plateau, but is by no means common, as is the Javan species, so Mr. Fruhstorfer informs us, in suitable localities.

69. Cœlites epiminthia, Westwood.

Grose Smith. Hagen. Distant. Kirby. Rare, and occurs in dense forests only as high as Namoe Oekor.

70. Cœlites humilis, Butler.

Grose Smith as *euptychoides* [sic]. Hagen as *euptychoides* [sic]. Very rare, Dr. Martin has obtained two or three specimens only. It may be known from the *C. euptychioides* of Felder, which is apparently confined to Borneo, by the female being devoid of all ultramarine-blue coloration on the upperside of the hindwing. The pupils of the ocelli on the underside of all the species of the genus are of a lovely iridescent blue colour which is only visible in some lights. This is also the case in the allied genus *Ptychandra*, Felder, from the Philipines.

71. *Cœlites nothis, Doubleday and Hewitson.

Hagen. This rare species was described from "East India." M. Charles Oberthür possesses two males and a female, and there is a female in the British Museum; these are all the known specimens. Its precise habitat is unknown.

In Sumatra the species of *Cœlites* are inhabitants of dense virgin forests, are very shy, but settle often, and can only be captured by approaching them most gently and carefully. They always rest with folded wings, and are not easily seen on the dark ground covered with leaves of all shades in the dim recesses of the forest. Their shyness and the difficulty of discovering and capturing them may be the real reason why they are so seldom met with in collections. Dr. Martin is of opinion that *Neorina lowii*, Doubleday and Hewitson, is a gigantic *Melanitis*, so he would call the species of *Cœlites* the *Melanitis* of the forest. Being true forest insects they exhibit a beautiful glossy blue colour (confer *Mycalesis orseis*, Hewitson, *ante* No. 50).

72. LETHE (*Nemetis*) MINERVA, Fabricius.

Hewitson as *arcadia*. Grose Smith as *arcadia*. Snellen as *arcadia*. Kirby. Apparently very rare in North-Eastern Sumatra, Dr. Martin having obtained one specimen only from the mountains. It is far less rare in Java.

73. LETHE (*Debis*) MEKARA, Moore.

Hewitson. Grose Smith. Hagen. Semper. Snellen. Common everywhere in the plains, in the mountains, and even on the Central Plateau; the specimens from the mountains have the yellowish-red colour on the upperside of the hindwing more extensive than those from the plains. The insect is always met with near bamboos, on which the larva feeds, and is even very common in Bindjei.

74. LETHE (*Debis*) CHANDICA, Moore.

Hagen. Very rare, in the higher mountains and on the Central Plateau. Dr. Martin has not obtained more than ten or twelve specimens during his long sojourn in the island.

75. LETHE (*Debis*) DARENA, Felder.

L. darena, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. viii, p. 40, n. 3, pl. K, fig. 7, *male* (1893).

Very rare in the Battak mountains, and not found below 3,000 feet elevation. Dr. Martin wishes to add:—"I cannot lose this opportunity to present my compliments to my friend Mr. Lionel de Nicéville for his extraordinary entomological knowledge and keen insight in having seen only the drawing of the very different female of *Lethe darena* in Dr. Felder's Reise Novara, Lepidoptera, and from that being able to determine the first male obtained by me, which I took to him on paying my first visit to Darjiling, after I had had the animal returned to me as undeterminable from Berlin. Afterwards I sent collectors especially to the mountains to obtain females, when de Nicéville's identification was splendidly confirmed. As far as I am aware, no specimens from Java, from whence this species was first obtained, have been recorded since the female was described by Dr. Felder. *L. darena* is doubtless one of the rarest, as well as one of the most beautiful, if not the most beautiful, species in this large genus."

76. LETHE EUROPA, Fabricius.

Snellen. Hagen as *europa* and *arete*. Distant. Occurs in nearly the same localities as *L. mekara*, Moore, and has the same habits but is considerably rarer, especially the female. Dr. Hagen records both *L. europa* and *L. arete*, Cramer, from Sumatra. The latter, according to Mr. F. Moore, is found in the Sula islands and Amboina only, while *L. arcuata*, another allied species described by Butler, is confined to Celebes.

77. LETHE ROHRIA, Fabricius.

Snellen. Hagen. A common species, but confined to the Central Plateau of the Battak mountains.

78. *YPTHIMA CEYLONICA, Hewitson.

Elwes. Unknown to us from Sumatra. It occurs on the eastern coast of India (Orissa and Ganjam), in South India, and in Ceylon.

79. YPTHIMA BALDUS, Fabricius.

Hewitson. Grose Smith. Hagen as *methora*, Fabricius [sic]. Elwes. Probably the commonest species of *Ypthima* in the plains and found everywhere. The larva feeds on the same ubiquitous *Gramineæ* as *Mycalesis mineus*, Linnæus. Dr. Hagen evidently followed Mr. W. L. Distant in Rhop. Malay., who described and figured this species erroneously under the name of *Y. methora*, Hewitson. No species of *Ypthima* presents dry-season forms in Sumatra, all are strongly ocellated.

80. YPTHIMA IARBA, de Nicéville.

Y. iarba, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. x, p. 18, n. 4, pl. R, figs. 7, *male*; 8, *female* (1895).

Very rare, in all Dr. Martin has not obtained more than a dozen specimens. It is of large size, 1·6 to 1·8 inches in expanse, and has five ocelli only on the hindwing, a pair at the anal angle, a pair in the median interspaces, and a single one in the upper subcostal interspace.

81. YPTHIMA PHILOMELA, Johanssen.

Snellen as *hübneri*. Hagen as *hübneri*. Distant as *hübneri*. Common everywhere in the plains like *Y. baldus*, Fabricius. I follow Mr. Moore in my identification of this species (Lep. Indica, vol. ii, p. 74, pl. cx, fig. 4, *male* (1893), which he records from Sumatra. It is of small size, has six ocelli in pairs on the underside of the hindwing, and has an inconspicuous patch of androconia on the upperside of the forewing. The *Y. huebneri* of Kirby, under which name the present species has apparently been recorded by three writers from Sumatra, is quite a distinct species, with no "male-mark," and with four ocelli only placed one and three, and does not appear to occur in the island. The *Y. tabella* of Marshall, from South India and Burma, of which the type specimen is in my collection, appears to me to be the same as *Y. philomela* of Johanssen. Mr. Elwes in his monograph of the genus *Ypthima* places the "*Papilio*" *philomela*, Johanssen, as a synonym of *Y. baldus*, Fabricius, but with a query. He gives *Y. tabella* as a certain synonym of *Y. baldus*. Nowhere does Mr. Elwes refer to the *Y. philomela* of Linnæus. All Mr. Moore says about it is that it is quite distinct from *Y. hübneri*, Kirby, and has six ocelli on the hindwing disposed in three pairs (Lep. Ind., vol. ii, p. 81). I am, therefore, quite in the dark as to how *Y. philomela*, Johanssen, and *Y. philomela*, Linnæus, are supposed to differ. Mr. Moore gives the *Y. philomela* of Hübner as a synonym of *Y. huebneri*, Kirby.

82. YPTHIMA PANDOCUS, Moore.

Snellen. Hagen. Distant as *corticaria*. Occurs in Sumatra only on the Central Plateau of the Battak mountains at an elevation of not less than 3,000 feet. Mr. Moore retains *Y. corticaria*, Butler, as a distinct species; I quite agree with Mr. Elwes in placing it as a synonym of *Y. pandocus*. Mr. Distant treats *Y. corticaria* as a "var." of *Y. pandocus*.

83. YPTHIMA FASCIATA, Hewitson.

Hewitson. Grose Smith. Distant. Kirby. Elwes. Decidedly rare, occurs only in the forests of the lower hills rarely at Namoe Oekor, but never at a lower elevation. Like the species of *Mycalesis* all the species of *Ypthima* are not as fond of the sun as most other butterflies, and fly on rainy days. They are partial to flowers, and will even go to high shrubs when in blossom, which *Mycalesis* will never do.

84. RAGADIA CRISIA, Hübner.

Hewitson. Snellen. Hagen. Distant. A common species in the plains and is found not only in the large and high forests, but also in young and not very high jungle with the ground covered with grass which it prefers. Often met with in pepper gardens; plentiful at Batoe Gadjah near the Begoemit river. It has a very weak flight, often settles, and is easily captured. It is very variable in both the shade of the ground-colour of the upperside and the extent of the white on the underside, some specimens having the white bands fully twice as broad as others.

85. *RAGADIA MAKUTA, Horsfield.

Mr. Moore records *R. crisia*, Hübner, from the Malay Peninsula and Borneo, and *R. makuta*, Horsfield, from Sumatra and Java. I have an extensive series of *Ragadias* from all these localities, and while these specimens shew great variation in the colour of the ground and the respective width of the bands, it appears to me obvious that they all represent one species. Until the publication of vol. ii of Mr. Moore's "Lepidoptera Indica," p. 113 (1893), *R. makuta* was always given as a synonym of *R. crisia*, and Mr. Moore in that work does not give his reasons for separating them.

86. ERITES ELEGANS, Butler.

Hagen. The rarest of the three Sumatran species of the genus.

87. ERITES ARGENTINA, Butler.

Grose Smith as *madura* [sic]. Hagen. Somewhat rare.

88. ERITES ANGULARIS, Moore.

Hewitson as *madura* [sic], var. The commonest species of the genus occurring in Sumatra. *E. medura*, Horsfield, is confined, as far as our present knowledge extends, to Java and Palawan in the Philippines. All the species of *Erites* are true forest butterflies, and they are not only found in the large virgin forests, but also in younger jungle with plenty of grass under foot. At an elevation of 1,200 feet they disappear. On the wing they remind one of *Ragadia*, as they also have a very weak flight, and often settle with closed wings. It is a very interesting fact that in such a relatively small area as are the districts of Deli, Langkat, and Serdang, three quite distinct species of this rather small genus should be found. (*Confer* de Nicéville, Journ. A. S. B., vol. lxii, pt. 2, p. 1 (1893).

89. MELANITIS ISMENE, Cramer.

Hewitson as *Cyllo leda*. Snellen as *Cyllo leda*. Hagen as *leda* and *ismene*. Distant as *leda* and *ismene*. The dry-season form (*ismene*) and wet-season form (*determinata*, Butler), occur together at the same time and at all seasons of the year, but are most plentiful in the rainy-season from October to January in rice-fields, on which the larva feeds, as well as on certain coarse species of grass. It is delightful to a lepidopterist who loves insects alive in their native haunts as well as dead, dried, and pinned in his cabinets to see two males fighting together and flying up very high into the air, then returning with periodical regular movements to the spots from whence they started. As this happens mostly after sunset, the silhouettes of the insects are very sharp and clear against the golden evening sky of the tropics. In consequence of the well-known habit of *Melanitis* to be on the wing before sunrise and after sunset, it sometimes comes into the lighted open verandahs of the houses—quite a stranger amongst a crowd of moths and insects of all orders.

90. MELANITIS BELA, Moore.

Hagen as *suyudana*. Semper as *suyudana*. Decidedly rare, and has nearly the same habits as *M. ismene*, Cramer, but prefers small jungle rather than the borders of fields, gardens, &c. Like *Neorina lowii*, Doubleday and Hewitson, it is exceedingly fond of the sap from certain trees. Dr. Hagen has quite correctly observed that in the early morning hours *M. bela* is still earlier on the wing than *M. ismene*, and that it has already retired to rest as that species and some *Mycalesis* appear. *M. bela* occurs under two forms:—the one which corresponds to the wet-season form of the species in India (*aswa*, Moore), has the upperside of the wings in the male velvety-black, with the apex of the forewing but very slightly angulated; the other, which corresponds to the dry-season form of the species in India (true *bela*), has the upperside of the wings in the male much paler, of a rusty-brown hue, often with subapical spots in the forewing on the upperside, with the apex of the wing strongly angulated. The first of these forms equals *M. abdullæ*, Distant, the second *M. suyudana*, Moore. Mr. Moore in Lep. Ind., vol. ii, p. 137, continues to keep the two last-named species distinct, and records it from Sumatra under the name of *M. suyudana*, but as I possess good series of both from the localities whence they were described, I have no hesitation in sinking them both as synonyms of *M. bela*.

91. MELANITIS ZITENIUS, Herbst.

Distant. The rarest species of the genus occurring in Sumatra, and found only at the higher elevations from 500 to 2,000 feet. In thirteen years Dr. Martin has obtained a dozen specimens perhaps.

Subfamily ELYMNIINÆ.

92. ELYMNIAS NIGRESCENS, Butler.

Hagen. I have found great difficulty in identifying satisfactorily the common species of *Elymnias* of the *undularis* group occurring in Sumatra. Mr. Distant seems to have had similar difficulty with the Malay Peninsula species, *vide* Rhop. Malay., p. 61. *E. nigrescens* was described by Butler from Sarawak, Borneo, both sexes are described and one is figured, but it is not stated whether that figure was taken from a male or a female, but probably the latter. I have nothing very like it from Sumatra or Borneo. Distant figures two female specimens from the Malay Peninsula, which were presumably compared with the types, besides which Mr. Butler himself records *E. nigrescens* from the Malay Peninsula. Our specimens agree very fairly with Distant's two figures, so I have adopted the name he uses for it. The males have sometimes no blue coloration on the upperside of the forewing whatever, sometimes there is a more or less complete series of marginal spots, which are most prominent at the apex of the wing. The hindwing is usually immaculate, but sometimes there is a marginal series of whitish spots. The female is very similar to the male, but the ground-colour of the upperside is paler and more reddish, and the blue spots are usually more prominent. Sumatran specimens of both sexes are frequently smaller and duller-coloured than specimens from the Malay Peninsula and Borneo. No orange form of female (*E. undularis*, Drury, from India; *E. tinctoria*, Moore, from Burma; *E. fraterna*, Butler, from Ceylon; *E. discrepans*, Distant, from the Malay Peninsula; and *E. protogenia*, Cramer, from Java) is ever found in Sumatra. This species is by far the commonest of the subfamily occurring in the island, and is found in the plains all the year round in ever succeeding generations. The larva feeds on the rattan cane, and doubtless on various species of palms also.

93. *ELYMNIAS LEUCOCYMA, Godart.

Hagen as *leucocyma*, Godardt [sic]. This species was described from males from Java, and is evidently very closely allied to *E. undularis*, Drury, from India. May not *E. leucocyma* be a synonym of *E. protogenia*, Cramer? It is doubtful if two distinct species of this group are found in Java. Dr. Hagen records two species of *Elymnias* of this group from Sumatra, but I have only seen one, which, however, is decidedly variable, but cannot in my opinion be split up into separate species.

94. ELYMNIAS LUTESCENS, Butler.

Grose Smith as *panthera*. Hagen. Butler. Distant. Kirby.

Staudinger as *panthera*, Fabricius, var. *lutescens*, Butler. Wallace. Very rare in the forests of the plains and as high as Namoe Oekor. This insect is perhaps not really as rare as it appears to be; as it greatly resembles on the wing a brown *Euplœa*, it probably often from this cause escapes the notice of the collector.

95. ELYMNIAS DARA, Distant.

E. dara, Distant, Ann. and Mag. of Nat. Hist., fifth series, vol. xix, p. 50, n. 36 (1887).

This species was described from Northern Borneo. An allied species is the *E. albofasciata*, Staudinger, from Palawan in the Philippine Isles, described in Iris, vol. ii, p. 39 (1889). We have not had the opportunity of comparing *E. dara* and *E. albofasciata* from typical localities, but a female of the latter from Palawan kindly sent to me by Dr. Staudinger agrees exactly with Sumatran specimens of the same sex. The Burmese species, *E. dædalion*, de Nicéville, is certainly distinct from the Sumatran and Philippine form which we here identify as *E. dara*, but whether it is separable from *E. dara* from Borneo we cannot say. It is very rare in Sumatra, and has been brought in from the Gayoe and Battak mountains from high elevations only.

96. ELYMNIAS (*Melynias*) LAISIDIS, de Nicéville, n. sp.

Grose Smith as *lais*. Hagen as *lais*, Horsfield and Moore [*sic*]. Wallace as *lais*. Distant as *lais*.

HABITAT: N.-E. Sumatra.

EXPANSE: ♂, 2·9 to 3·3; ♀, 3·5 to 3·7 inches.

DESCRIPTION: MALE. Very similar to *E. lais*, Cramer, from Nias, Java, and Borneo. FEMALE. In general appearance very similar to the same sex of *E. malelas*, Hewitson, from Sikhim, Bhutan, Assam, and Burma, the wings being greatly elongated, and the *forewing* on the UPPERSIDE having the apical half strongly washed with purple.

I possess a single female only of *E. lais* from Java, from which the female of *E. laisidis* differs in its more elongated forewing glossed with purple on the upperside. Dr. A. R. Wallace has described but not named the Sumatran form of *E. lais* in Trans. Ent. Soc. Lond., 1869, p. 325, n. 11. *E. laisidis* occurs nearly always near human habitations, and Dr. Martin feels sure that the larva feeds on bamboos, as the females are always seen flying along the bamboo hedges surrounding the gardens of Malay houses. It occurs most commonly in December and January, and in some years (1892 and 1893) was unusually abundant, being seen almost in swarms. In India the allied *E. timandra*, Wallace, has been noted in the Khasi Hills of Assam occurring in thousands in some years in a similar manner. In other years *E. laisidis* is very rare, and then found near the sea coast (at Laboean) commoner than higher up. The female, on the vivid blue coloration of the upperside of the forewing of which the species is mainly based, is undoubtedly a very splendid mimic of *Euplœa linnæi*, Moore.

97. ELYMNIAS (*Melynias*) CERYXOIDES, de Nicéville.

E. (*Melynias*) *ceryxoides*, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. x, p. 22, n. 7, pl. S, fig. 13, *male* (1895).

Grose Smith as *ceryx*. Hagen as *ceryx*. Occurs only on the Central Plateau at not less than 3,000 feet elevation, and similarly to *E. laisidis* is found in June and July, but chiefly in December and January. Dr. Martin's brother, Dr. F. Martin, took it on the southern extremity of the Toba Lake near Batoe Gadjah, which is higher than the plateau.

98. ELYMNIAS (*Melynias*) ERINYES, de Nicéville.

E. (*Melynias*) *erinyes*, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. x, p. 19, n. 5, pl. R, figs. 9, *male*; 10, *female* (1895).

A very rare species found only in the high forest at Selesseh and up to the lower slopes of the hills at Bekantschan, and in the Battak mountains in September. Dr. Martin has obtained three specimens only. It is nearly allied to *E. casiphone*, Hübner, more closely to *E. kamara*, Moore.

99. ELYMNIAS (*Melynias*) DOHRNII, de Nicéville.

E. (*Melynias*) *dohrnii*, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. x, p. 21, n. 6, pl. S, fig. 12, *male* (1895).

This species was described from a single male obtained in September, 1894, at Bohorok near the Battak frontier by Herr M. Ude, the European collector of Dr. H. Dohrn of Stettin. As Bohorok is on the way to the Gayoe and Allas countries, it is possible that this *Elymnias* may occur there more plentifully, as these regions are quite unknown. It is allied to *E. patna*, Westwood.

100. ELYMNIAS (*Bruasa*) SUMATRANA, Wallace.

Wallace. Kirby. Grose Smith as *sumatrana* and *penanga*. Hagen as *penanga*, Westwood, var. *sumatrana*. Originally described from Sumatra. A very rare species. It occurs in March in the forests near the sea together with *Euplœa eunus*, de Nicéville. The female may be considered to be one of the rarest butterflies of our region; in all the time Dr. Martin was in Sumatra he only obtained three specimens, one of which he caught himself in a forest near the Saentis Estate, not more than two miles from the sea.

101. ELYMNIAS (*Bruasa*) ABRISA, Distant.

Very rare in the high forest near Selesseh in July and at Namoe Oekor. Both sexes are described by Mr. Distant, and the male is figured. We have seen only seven female specimens. But for the fact that Mr. Distant describes the male, we would certainly have considered this species to be a dimorphic form of the female of *E. sumatrana*, Wallace.

102. ELYMNIAS (*Agrusia*) ESACOIDES, de Nicéville.

Dyctis esacoides, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. vii, p. 323, n. 2, pl. H, fig. 2, *male* (1892).

Exceedingly rare, three specimens only have been obtained, one in the forest near Selesseh in July, two from the lower hills. All the rarer species of *Elymnias* have a soft weak flight and settle often with folded wings. They are very fond of shadowy spots and of rest, and once settled they remain for a long time, leaving their resting places only when frightened or driven away. As they all rest with shut wings they are in this position much less conspicuous than when on the wing.

Subfamily AMATHUSIINÆ.

103. ZEUXIDIA AMETHYSTUS, Butler.

Hagen. Kirby. Butler. Distant. Staudinger. Rare; found only in dense virgin forests like all the rest of the genus not at a lower elevation than Bekantschan in September. It occurs higher in the hills than any other *Zeuxidia*. The female has the macular band on the upperside of the forewing ochreous-white.

104. ZEUXIDIA NICEVILLEI, Fruhstorfer.

Z. nicévillei, Fruhstorfer, Ent. Nach., vol. xxi, p. 196 (1895).

Fruhstorfer. Described as being a local form of *Z. doubledaii*, Westwood. The latter was described from a female specimen from "India," and is somewhat roughly figured in the Genera of Diurn. Lep. on pl. lii, fig. 1. Distant figures both sexes and records it from Penang and Perak. Moore records it from Penang. I have compared both sexes from Perak with both sexes from Sumatra, and Sumatra females with Hewitson's original figure, and can discover no differences whatever. Herr Fruhstorfer has recently been to London and has probably compared his types of *Z. nicévillei* with the type of *Z. doubledaii*, so on his authority I maintain the species as distinct. In Sumatra *Z. nicévillei* is rather more common than *Z. amethystus*, Butler, and it occurs at Bekantschan and Selesseh in June and August, and even at Batang Serangan, still nearer the sea; also in Asahan. The female has the macular band on the upperside of the forewing violet-white.

105. * ZEUXIDIA LUXERII, Hübner.

Grose Smith as *Amathusia* [sic] *luxerii*. Only known to us from Java, where it is the commonest species in the genus.

106. ZEUXIDIA (*Amaxidia*) AURELIUS, Cramer.

Grose Smith as *Amathusia* [sic] *aurelius*. Staudinger. Kirby. Distant. This species was originally figured and described by Cramer from a female obtained on the west coast of Sumatra. Occurs from Selesseh to Bekantschan and even higher in May and September; is rarer than the other species of the genus. The female often measures six and a half inches across the wings, and is one of the largest-known *Rhopalocera* in total wing area. The female has the band on the upperside of the forewing white. All *Zeuxidias* are only met with in large high forest near small streams, on whose borders there are usually some bamboos, on the leaves of which most probably the larva feeds. They fly rapidly but settle often, but always in a dense mass of branches and stems of bushes, so that they are very difficult to secure. The best way to collect them is to place rotten plantain fruit (pisangs or bananas) along the streams they haunt, to which they will come. The males of all our *Zeuxidias* are true inhabitants of the forest, and exhibit rich blue colours on the upperside. When settled with closed wings their very great resemblance to dead leaves on the underside makes them very difficult to distinguish amongst the true dead leaves which always and at all seasons strew the forests in the tropics. In South-East Borneo (Bandjermassin) all species of *Zeuxidia* appear to be far commoner than they are in Sumatra, the Malay Peninsula and Burma. Out of 1,000 specimens of butterflies Dr. Martin received from thence, 200 were three species of *Zeuxidia*.

107. AMATHUXIDIA DILUCIDA, Honrath.

Occurs only in high forest in July, and is found up to the elevation of Bekantschan. Very rare, Dr. Martin obtained five specimens only in thirteen years; one pair from Aer Kesoengei in Asahan. It has the same habits as *Zeuxidia*, and is difficult to secure.

108. AMATHUSIA PHIDIPPUS, Johanssen.

Grose Smith. Snellen. Semper. Distant. Hagen. It sometimes does great damage to the beautiful green leaves of the young cocoa-nut palms, *Cocos nucifera*, Linnæus, on which the larva feeds, and which after some while present the appearance of ugly dried-up brushes. The larva also ate the leaves of other palms in Dr. Martin's garden at Bindjei, for instance the African oil palm and the common Palmyra or fan-leaf palm. The caterpillars live socially when young, but separate after changing their last skin. They are green with reddish-brown hairs. The larva of a large Skipper, *Hidari irava*, Moore, feeds at the same time on the leaves of *Cocos nucifera*, and the two species often have a severe struggle to live together, in which the more robust hesperid, which secures a shelter for itself by spinning the leaves together, is generally victorious. The pupa is uniform light green, and hangs perpendicularly on horizontal leaves. The butterfly appears most commonly in December and January, after which time only single specimens are seen. In the daytime it is only found in places where there is deep shade, it never ventures out into the open sunlight, but is most active after sunset, and like *Melanitis* comes sometimes to the lamps. In its prediliction for shade it often enters houses and sheds. It is a very variable species.

109. AMATHUSIA SCHOENBERGI, Honrath.

A. schönbergi, Honrath, Berl. Ent. Zeitsch., vol. xxxi, p. 347, pl. vi, fig. 1, *male* (1887).

This species was originally described from Tanyong Malim, Perak, Malay Peninsula. It appears to be a distinct species, while *A. ochraceofusca*, Honrath, and *A. phidippus*, var. *perakana*, Honrath, both from Perak, seem only to be varietal forms of *A. phidippus*, Johanssen. It is the *Amathusia* of the forest, as it occurs only in high forest from Selesseh to Bekantschan. As in the forests there are no cocoa-nut trees, that palm being nearly domesticated, *A. phidippus* does not occur there, but is replaced by the far finer and deeper-coloured *A. schoenbergi*. Dr. Martin's Javan collector Saki observed a female of this species depositing eggs on *Areca nibong*, which palm only grows in the forest, and there is not any doubt that the larva of *A. schoenbergi* feeds on this plant, round groups of which Dr. Martin always noticed the imagines flying. It is, however, a very rare species.

110. THAUMANTIS ODANA, Godart.

Grose Smith. Hagen as *klugius*. Staudinger. Distant. The commonest species of the genus in Sumatra, next to *T. lucipor*, Westwood; it is found from Bekantschan to Soengei Batoe, and is therefore the most alpine species of the genus.

111. THAUMANTIS (*Kringana*) NOUREDDIN, Westwood.

Occurs at the lowest elevations and nearest the sea of all the species in the genus, as nearly all specimens obtained by Dr. Martin came from Kampong Stabat, and were caught in forests on both sides of the Wampoe River. He also obtained one pair as far south as Asahan.

112. THAUMANTIS (*Kringana*) LUCIPOR, Westwood.

The commonest of the three Sumatran species of the genus. It appears as low down as Bindjei, and is found as high as Namoe Oekor. Dr. Martin caught his first specimen of this species, a female, in June, 1888, at 7-30 p. m., flying along the white walls of his hospital so that he could just distinguish it to be a butterfly. In this species the blue reflections of the male on the upperside of both wings are so richly brilliant and powerful that in opening the wings of a closed specimen the pinchers used are strongly coloured with blue like the wings. All *Thaumantides* are inhabitants of the high virgin forest. They all like shade, and are on the wing very late after sunset. All are fond of the ripe fallen fruit of the Sumatran sugar-palm (*Arenga saccharifera*) on which they regale themselves in the shadow of the tree. They rest with closed wings, and only display their rich blue coloration when on the wing.

113. *TENARIS BIRCHI, Distant.

Originally described from Singapore. Recently taken by Dr. Hagen in Mandaheling, a Malay state in Western Sumatra.

114. DISCOPHORA NECHO, Felder.

Hagen as *necho*, Felder, var. *cheops*, Felder. Staudinger as *cheops*. Semper as *cheops*. I described this species as *D. dis* (Journ. Bomb. Nat. Hist. Soc., vol. vii, p. 325, n. 3, pl. H, fig. 3, *male* (1892). *D. necho* is a common species, and is found also in Java and Borneo. Semper records *D. celinde*, Cramer [should be Stoll] as well as *D. necho* from Sumatra. As *D. celinde* was described from Java where *D. necho* also occurs undoubtedly, it may be that both *D. celinde* and *D. necho* occur also in Sumatra. *Amathusia phidippus*, Johanssen, is the commonest, and *D. necho* the next commonest species of the subfamily in Sumatra. The males are very fond of frequenting fæces on roads, from which they fly into the jungle when disturbed, but return again as soon as danger is past. The females are much rarer, and only fly in the evening after sunset and then only very high up in the air, so that they can hardly be distinguished from

Melanitis, *Amathusia* and *Thaumantis* flying at the same time. Only when they come down to rest, or to deposit their eggs are they caught. The larva feeds on different *Gramineæ*, Dr. Martin has found them even on the famous Lalang grass (*Imperata arundinacea*), and on the sugar-cane (*Saccharum officinale*). The larvæ always keep in pairs, never more than two together; they rest with the head downwards, and eat the lower portions of the leaves on which they rest. The pupa is quite green, and is very similar to that of *A. phidippus*. *D. necho* is not found at a higher elevation than Bekantschan. It is probable that *D. necho*, Felder, *D. cheops*, Felder, and *D. dis*, de Nicéville, from Java, Borneo and Sumatra respectively, all represent a single species, of which the first-named is the oldest.

115. DISCOPHORA SONDAICA, Boisduval.

Hagen. Distant. Dr. Hagen records *D. tullia*, Cramer, as well as this species from Sumatra, but according to Mr. Moore, *D. tullia* is confined to China, especially to Hongkong. In all Dr. Hagen records four species of *Discophora* from Sumatra; we know two only. It is found at lower elevations than *D. necho*, Felder, not much higher than Bindjei, where it is not uncommon near bamboo hedges. The females as usual in the genus are much rarer than the males. Dr. Martin obtained his first female from a pupa which he found near the manager's house of the Bekalla Estate under the roof of a small attap shed on the riverside near a thicket of bamboos. The female is much more beautiful than the same sex of *D. necho*, which has only a broad oblique yellow band across the forewing on the upperside.

116. ENISPE EUTHYMIUS, Doubleday.

Hagen as *eutymius* [sic]. Sumatran specimens resemble the dark form of this species found in Assam and Burma which has been named *E. tessellata* by Mr. Moore, but which is certainly not a distinct species, as it is found in some localities with, and grades imperceptibly into, the typical form. Its occurrence in Sumatra while apparently absent from the Malay Peninsula is an interesting fact in geographical distribution. It is everywhere rare, and in Sumatra is found only on the Central Plateau, and is occasionally brought in by the Battak collectors. Dr. Hagen states that he has always obtained this species together with *Limenitis bockii*, Moore, which is a curious coincidence.

117. CLEROME ARCESILAUS, Fabricius.

Grose Smith. Snellen. Hagen. Distant. The commonest species of the genus in Sumatra as elsewhere.

118. Clerome kirata, de Nicéville.

C. kirata, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. vi, p. 344, n. 2, pl. F, fig. 3, *male* (1891).

The rarest of the three Sumatran species of the genus, and found in the same localities as *C. arcesilaus*, Fabricius. I have no difficulty in distinguishing the species, though Colonel Swinhoe fails to recognise it, *vide* his remarks on *C. arcesilaus* in Trans. Ent. Soc. Lond., 1893, p. 276, n. 77. The male was chiefly defined by a difference in the prehensores, but the superior width of the dark bands on the underside of both wings, and the anal half of the hindwing being very much darker than the same area in *C. arcesilaus* will enable one to distinguish the species superficially without recourse to an anatomical investigation. The female has the ground-colour on the underside of both wings much lighter than in *C. arcesilaus*, and all the bands consequently more prominent; they are also much wider.

119. Clerome gracilis, Butler.

Hagen as *gracilis*. *C. gracilis* is met with somewhat higher than *C. arcesilaus*, Fabricius, and is also rarer than that species. All the species of *Clerome* are true insects of the virgin forest, never leave the ground for a high flight, and prefer to settle on the bare soil or on a dead and discoloured leaf than on living green leaves or shrubs. They rest with folded wings, and fly only for short distances, and then again settle. No species occurs at a higher elevation than Bekantschan, nor nearer the sea than Bindjei.

120. Xanthotænia busiris, Westwood.

Hagen. Grose Smith as *Clerome* [sic] *busiris*. Butler. Distant. Found from Bindjei to Bekantschan. Like *Clerome* it is a true inhabitant of the forest, but has a higher and longer flight than species of that genus and is not so easily caught, as it is always changing the direction of its flight. It is fond of newly cut ditches through the forest, along which it may always be found.

Subfamily Acræinæ.

121. Pareba vestita, de Nicéville, n. sp.

Acræa vesta, Snellen (*nec* Fabricius), Midden-Sumatra, Lepidoptera, p. 13, n. 1 pl. ii, figs. 3–5, *female* (1892).

Snellen as *terpsichore*, Linnæus [sic], and *vesta*. Hagen as *vesta*.

Habitat: N.-E. Sumatra.

Expanse: ♂, 2·0 to 2·5; ♀, 2·4 to 2·5 inches.

Description: Male and female. Upperside, both wings differ from *A. vesta*, Fabricius, from the Himalayas, Assam, Upper Burma and Java in having the ground-colour more ochreous (less tawny), and all the veins more heavily defined with black. *Forewing* has a broad costal black margin reaching the subcostal nervure; the outer margin has the black border nearly twice as broad, with the marginal series of spots of the ground-colour obsolete or entirely absent. *Hindwing* has the black margin much broader, with the yellow marginal spots very much smaller. UNDERSIDE, *both wings* differ only in having all the veins more strongly defined with black.

Occurs only on the Central Plateau, where it appears to swarm to the same extent as the allied species does in Sikhim and elsewhere. Dr. Martin has had the larva and pupa brought to him by his collectors. It flies all the year round, and there is often an over population, after which it becomes somewhat scarce for a while till it recovers itself and again becomes common.

Subfamily NYMPHALINÆ.

122. ERGOLIS ARIADNE, Linnæus.

Snellen. Wallace. Hagen. Distant. This species may be known from the one that follows by its richer brighter tawny coloration, by the outer margin of both wings being much more irregular, and in the male by the "male-mark" present on the underside of the forewing, which, in this species, is a solid shining deep black patch reaching from near the inner margin to the third median nervule. Its larva feeds on the stinging creeper, *Tragia involucrata*. The butterfly is only found in the forest from Bindjei to Bekantschan, and always near its food plant. It has a low flight, only males when fighting fly high in the air.

123. ERGOLIS ISÆUS, Wallace.

E. isæus, Wallace, Trans. Ent. Soc. Lond., 1869, p. 333, n. 4.

Wallace. Kirby. Hagen as *taprobana*. Distant. Nearly allied to but quite distinct from *E. merione*, Cramer. The outer margin of both wings is much more even and regular than in the preceding species, and the coloration is duller and darker. The "male-mark" is in a similar position, but is very inconspicuous and consists of a broad line of modified black scales extending along either side of the veins on the disc of the forewing on the underside, but not reaching the outer margin nor the costa. *E. merione* has a quite different "male-mark," which is similar to that in *E. ariadne*, Linnæus. I have specimens of *E. isæus* from Myitta in Burma and from Singapore; Wallace records it from Singapore also and Sumatra. The larva feeds on *Ricinus communis*, Linn., the castor-oil plant. Occurs everywhere in the plains and all the year round, mostly near the houses of Indian (Tamil) coolies, who are very fond of cultivating the castor-oil plant. Its flight is perhaps lower and weaker than that of *E. ariadne*, Linnæus. Dr. Hagen records *E. taprobana*, Westwood, from Sumatra, a species confined to South India and Ceylon as far as our experience goes. It is a very noticeable fact that everywhere two quite distinct species of *Ergolis* occur together.

124. EURYTELA HORSFIELDII, Boisduval.

Hagen. Grose Smith.

125. EURYTELA CASTELNAUI, Felder.

Snellen. Hagen. Grose Smith. Both the Sumatran species of this genus occur only in forests, and are somewhat rare insects, the female being the rarer sex of the two. *E. horsfieldii*, Boisduval, occurs more in the plains, from Bindjei to Namoe Oekor; *E. castelnaui* at higher elevations, from Namoe Oekor to Soengei Batoe. The females are splendid mimics of the two preceding species of *Ergolis*, *E. castelnaui* mimicking *E. isæus*, Wallace, and *E. horsfieldii* mimicking *E. ariadne*, Linnæus. Even in the way of flying they closely resemble the flight of species of *Ergolis*. Dr. Martin obtained his first female of *E. castelnaui* while catching *E. isæus* on the same spot in a forest south of Namoe Oekor. The males always settle with folded wings for greater protection, and have some predilection for the sandy banks of small streams running through the forest.

126. EURIPUS HALITHERSES, Doubleday and Hewitson.

Hagen as *halitherses* and *euplœoides*. Staudinger. The male differs from typical *E. halitherses* in having the marginal dots on both sides of the forewing restricted more to the anal angle. The female is trimorphic, in one form the ground-colour is brown as in typical *E. euplœoides*, Felder; in the second form it is indigo-blue; in the third form it is blue without white patches on both wings and mimics *Euplœa linnæi*, Moore. The first two forms seem to be mimics of *Euplœa diocletianus*, Fabricius. As usual, the amount of white coloration on the wings in the female is very variable, and on that character no species should be based. One of these inconstant forms has recently been described by Mr. Distant as *E. borneënsis*, and seems to be intermediate between *E. euplœoides* and *E. pfeifferæ*, both of Felder, from the Malay Peninsula. This species was, before the forests of Deli and Langkat fell victims to the triumphal march of the tobacco cultivation, a fairly common insect, of which the males often escaped capture by being mistaken for a still commoner species of *Athyma*. Even now on the frontiers of tobacco-land, as at Selesseh, *E. halitherses* is not rare, only the females are scarce. The males have a strong short flight like species of *Athyma*, whereas the females on the wing mimic different species of *Euplœa*, having a slow and sailing motion. Dr. Martin possesses a single male almost without white markings on the upperside of the forewing, which for a long time he thought represented a second species, but as he never obtained a second specimen, it is probably an aberration. *E. halitherses* extends from Bindjei to Bekantschan, and is found only in forests.

127. Cupha erymanthis, Drury.

Snellen. Hagen. Occurs everywhere all the year round in ever following generations. Wherever a small piece of forest has been spared, there this is one of the first *Rhopalocera* to be found. It is very fond of flowers, but is shy, and has a restless flight.

128. Atella sinha, Kollar.

Snellen as *egista*. Hagen as *egista*. Grose Smith. Wallace. Distant. I have never seen *A. egista*, Cramer, which was described from Amboina, and recorded from Amboina, Bouru, Batchian, Morty, and New Guinea by Dr. A. R. Wallace. *A. sinha* is the rarest of the *Atellas* occurring in Sumatra, is found both in the plains and hills, has a very quick flight, and is not easily captured except when settled on a flower or on a moist spot on a forest road where it can be "potted" with the net.

129. Atella phalantha, Drury.

Snellen. Hagen as *phalanta* [sic], Horsfield and Moore [sic]. Distant as *phalanta* [sic]. Occurs only at low elevations, often very near to the sea, frequents flowers, and is not easily caught from its shy restless habits and quick flight. It is very common throughout the year.

130. Atella alcippe, Cramer.

Snellen. Hagen. Grose Smith as *aruana* [sic]. The *A. arruana* of Felder, from the Aru Isles (*Felder*), Mysol (*Wallace*), is a local race of *A. alcippe*. Found in Sumatra at higher elevations than the two foregoing species, even as high or higher than Bekantschan. Never seen in Deli, and never on black soil which is so favourable for tobacco, but as soon as there is red soil, as in Langkat and Serdang, one may be sure to meet *A. alcippe* on damp places in forest roads. It is very common near Selesseh.

131. CETHOSIA HYPSINA, Felder.

Snellen as *penthesilea* and *cyane*. Grose Smith as *hypsea*. Hagen as *cyane*. Wallace. The *C. penthesilea* of Cramer appears to be a distinct species, and occurs in Java. The *C. hypsea* of Doubleday and Hewitson is the Bornean form. *C. cyane*, Drury, is the Indian form.

132. CETHOSIA CAROLINÆ, Forbes.

C. carolinæ, Forbes, A Naturalist's Wanderings, p. 274 (1885).

A local race of *C. methypsea*, Butler, of the Malay Peninsula.

133. CETHOSIA LOGANI, Distant.

Hagen as *logani* and *biblis*. May perhaps be a local race of *C. biblis*, Drury, but in the Malay Peninsula both occur together. It may be noted that Dr. Hagen records both in one paper from Sumatra, so both may be found there also. *C. hypsina* and *C. logani* occur at low elevations, the latter even close to the sea—Dr. Martin once found many larvæ near the Saentis Estate only two miles distant from the sea—whereas *C. carolinæ* appears at the elevation of Bindjei, and from thence to the Central Plateau, those from high elevations being very richly coloured. All species of *Cethosia* are forest butterflies, frequenting both large and small jungle. The always sombre dark green forest is often made of a gayer aspect by the presence of these numerous, vivid, and gorgeously-coloured butterflies. Their flight resembles that of the *Danainæ* and is slow and sailing. The larvæ of *C. hypsina* and *C. logani* live on *Passiflora* sp., and eat not only the leaves but also the soft shoots of this creeper. The larva of *C. logani* is yellow with black longitudinal stripes, of *C. hypsina* of a very rich deep scarlet, broken only on the two median segments, which are creamy-white. Both larvæ have composite spines, they live in societies, and are always found in large numbers. On one occasion when Dr. Martin was collecting the larvæ of *C. hypsina* on a Passion-Flower with red fruit, he noticed the protective position assumed by some of the caterpillars which in eating a twig had surrounded it entirely, so that this bunch of larvæ even at a short distance looked like one of the fruits. In breeding a large number of *C. hypsina*, Dr. Martin noticed that the males emerged from the pupæ one day earlier than the females. None of the Sumatran species of *Cethosia* are dimorphic in the female, and none of them have dark females as have the species from India, Ceylon, and Nias.

134. TERINOS ATLITA, Fabricius.

Snellen. Grose Smith. Kirby. Hagen as *teuthras*, var. *delianus*, so named, but not described, in Dr. O. Staudinger's sale list No. xxxiii (1889). Wallace as *viola*. Wallace described *T. viola* from Singapore and Sumatra, but pointed out that the male he described from Sumatra differed somewhat from his specimen from Singapore. The latter equals *T. teuthras*, Hewitson, *teste* Distant, the former *T. atlita*.

135. TERINOS CLARISSA, Boisduval.

Snellen as *larissa* [sic], Boisduval.

136. TERINOS TEOS, de Nicéville.

T. teos, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. viii, p. 41, n. 4, pl. K, figs. 5, *male*; 6, *female* (1893).

Grose Smith as *robertsia*. Snellen as *robertsii* [sic]. Hagen as *robertsia*, var. ? *sumatrana*, so named, but not described, in Dr. O. Staudinger's sale list No. xxxiii (1889) as var. *sumatrensis*. Wallace as *robertsia*, local form A. This species is a local race of *T. robertsia*, Butler, from the Malay Peninsula. Without knowing the habits of the species of the genus *Terinos*, one would know from their rich violet-blue coloration that one has to deal with true inhabitants of large forests, which never go to small jungle as the foregoing *Cethosiæ* often do. *T. clarissa*, Boisduval, is very rare, and no exact locality for it can be given except one specimen from Bekantschan, as all the specimens procured were brought in with numerous specimens of *T. teos*, de Nicéville, Dr. Martin not noticing the difference between these two species till I pointed it out to him. *T. atlita*, Fabricius, occurs more in the plains, but not at a lower elevation than Bindjei and Selesseh, but does not extend higher than Namoe Oekor. *T. teos*, de Nicéville, commences to appear at the same places and is found as high as Bekantschan and the lower hills. The butterflies are very restless, and fly round certain trees, on which they rest for a moment and then fly off again, so are not easy to catch, besides which they usually settle high up and fly high too. In November and December both the common species appear in large numbers, while in all the other months they are only procured singly, and are very worn, so Dr. Martin thinks that they may be only single brooded. At Namoe Oekor in October Dr. Martin and I caught only worn females, males being entirely absent, and in December of the same year the collectors brought in many males and a few fresh females from the same spot. Otherwise females are always rarer than the males, especially that sex of *T. atlita*. The female of *T. clarissa* is unknown to us from Sumatra. No Sumatran species of the genus shew the beautiful whitish-violet patch on the upperside of the hindwing found in *T. teuthras*, Hewitson, and *T. robertsia*, Butler, from the Malay Peninsula.

137. Cynthia erotoides, de Nicéville, n. sp.

C. deione, Distant (*nec* Erichson), Rhop. Malay., p. 184, n. 1, pl. x, figs. 1, *male*; 2, *female* (1883).

Snellen as *arsinoë*. Hagen as *arsinoë*. Staudinger as *arsinoë*. Kirby as *arsinoë*. Distant as *deione*.

Habitat: Malay Peninsula, N.-E. Sumatra, Borneo.

Expanse: ♂, 2·9 to 3·2; ♀, 3·7 to 4·0 inches.

Description: Male. Upperside, *both wings* differ from *C. erota*, Fabricius, from the Eastern Himalayas, Bhutan, Assam, Burma, and Java in their darker ground-colour. *Forewing* differs in the apex being widely and the outer margin decreasingly infuscated. Otherwise as in that species. Female. Upperside, *hindwing* differs only in having the inner of the two submarginal fuscous lines straighter—less lunulated—and continuous. Otherwise as in that species.

Cramer described *C. arsinoë* from Amboina and the west coast of Sumatra, but apparently figured it (a male) from the former locality, my specimens from Saparua in the Moluccas and from New Guinea agreeing fairly well with Cramer's figure. *C. dejone*, Erichson, was described from Luçon in the Philippines, the female being figured. In the male of this species the apex of the forewing on the upperside is not infuscated, and in the female the ocelli of the hindwing on the upperside differ in being almost entirely ochreous, with a very small instead of a large black centre. *C. cantori*, Distant, described from a unique specimen from Province Wellesley, is probably a "sport." The males of *C. erotoides* are common everywhere in Sumatra, and are found all the year round on forest roads, where they are fond of moist spots, to which they will always return even after an attempt is made to catch them. The females are as rare as the males are common, and are only found in the forest. The males have a strong short flight, somewhat like that of a *Charaxes*, whereas the females fly more slowly and sail more. The species is found only as high as Bekantschan.

138. Cynthia battaka, Martin.

C. battaka, Martin, Nat. Tijd. voor Neder.-Indië, vol. liii, p. 338, n. 3 (1893).

This species may typically be known from *C. erotoides*, de Nicéville, by its smaller size, darker ground-colour of the upperside, the apex of the forewing especially being much more infuscated, the basal area of both wings on the underside is of a deeper red, and the subapical spot in the upper discoidal interspace of the forewing is always silvery-white, while in *E. erotoides* it is either totally wanting, or, if present, is small and fuscous; the tail to the hindwing is also shorter. From Bekantschan to the higher hills and the Central Plateau *C. battaka* alone occurs, and it has the same habits as *C. erotoïdes.* As Dr. Martin never obtained the latter species from places higher than Bekantschan, and never true *C. battaka* from places lower than Bekantschan, and as both species occur quite at the same time, there can be no question here of seasonal dimorphism. Dr. Martin notes that he is quite sure *C. battaka* is a good species restricted to the mountainous regions of our area. He notes also that he has received some specimens of *C. battaka* from Java, but without exact locality, and hopes to hear later at what elevation they were obtained, as *C. erotoïdes* occurs also in that island. Dr. Martin further notes that he obtained one female of *C. battaka*, which differs greatly from the female of the former species, these differences are pointed out in his original description of *C. battaka* (l. c.).

139. APATURA NAMOUNA, Doubleday.

Hitherto this species has not been recorded south of Upper Burma, its re-appearance in Sumatra is most interesting. In our area it is a very rare butterfly, and is found only on the higher hills at an elevation of not less than 3,000 feet, and from the Central Plateau and the Gayoe mountains. The specimens from Sumatra are decidedly smaller than those from Northern India, but do not otherwise differ. No female from Sumatra has been obtained.

140. *APATURA PARVATA, Moore.

Grose Smith. This is almost certainly a wrong identification, *A. parvata* being restricted to Sikhim and Bhutan. The specimen Mr. Grose Smith obtained was probably a female of the next species.

141. APATURA (*Rohana*) SUMATRENSIS, Standinger.

A. (*Rohana*) *parisatis*, Westwood, var. *sumatrensis*, Standinger, Iris, vol. ii, p. 80 (1889).

A. parisatis, Snellen (*nec* Westwood), Midden-Sumatra, Lepidoptera, p. 19, n. 1, pl. iii, figs. 1, *male*; 2, *male underside* × 2 (1892).

Snellen as *parisatis.* Hagen as *parisatis.* Standinger as *parisatis*, and *parisatis*, var. *sumatrensis.* Semper as *camiba.* The male may be known from the N.-E. Indian and Burmese species, *A. parysatis*, Westwood, by having a small diffused apical ferruginous patch on the upperside of the forewing, which is absent from the continental species. The females of the two species differ but slightly. Like *Atella alcippe*, Cramer, this insect only appears on red soil (probably the food-plant of the larva grows only on that soil), where the males from Selesseh to the higher hills are not rare, whereas the females are always scarce, or apparently so, as they are excellent mimics of species of *Ergolis*, and are doubtless often passed over as such by the collectors. The males like to go to small muddy or swampy spots on the roads, where they are easily "potted" with a net. The females are never seen on the roads, but fly like *Ergolis* through the jungle. The male of this butterfly does not exhibit any very gorgeous coloration, but nevertheless it has a beauty of its own owing to the deep velvety-black colour of the upperside, which is so exceedingly delicate and so like the bloom on a peach that one never sees an absolutely perfect specimen in a collection. It is especially common on roads cut through the red hills on the banks of the Whampoe river, also in Serdang and Padang Bedagei.

142. APATURA (*Rohana*) ARTAXES, de Nicéville.

A. (*Rohana*) *artaxes*, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. ix, p. 261, n. 3, pl. N, figs. 3, *male*; 4, *female* (1895).

This species is restricted to the Central Plateau, from whence Dr. Martin obtained his first female specimens in October and December, 1893. As the males are very similar to the same sex of the foregoing species, they escape the nets of the Battak collectors, and Dr. Martin only obtained two in thirteen years. Many more females than males have been obtained. It would be interesting to know if the female is a mimicker, and if so, what species is mimicked.

143. EULACURA OSTERIA, Westwood.

Staudinger. Rare in Sumatra, and occurs only at Selesseh and Namoe Oekor in July. The female is rather rarer than the male. Both sexes settle on the underside of leaves with wide-spread wings, and never fly long distances. It is a common butterfly in the Botanical Gardens at Singapore.

144. HESTINA NAMA, Doubleday.

Hagen as *nama*, Boisduval [sic]. Staudinger. Occurs in Perak in the Malay Peninsula.

145. HESTINA CAROLINÆ, Snellen.

H. carolinæ, Snellen, Tijd. voor Ent., vol. xxxiii, p. 218 (1890); idem, id., l.c., vol. xxxvii, p. 67 (1890).

Snellen. Both species of *Hestina* occur in our area only in the hills and on the Central Plateau, the lowest elevation at which they are found (except one male of *H. carolinæ* which Dr. Martin caught near the iron bridge over the Bindjei river at Namoe Oekor) being Bekantschan. *H. carolinæ* flies in May. *H. nama* doubtless mimics *Danais* *tytioides*, de Nicéville, while *H. carolinæ* mimics *Danais banksii*, Moore. So long as these *Hestinas* think themselves safe and unobserved their flight closely resembles that of the *Danainæ*, but as soon as they scent danger they assume their proper rapid mode of flight, which is like that of the males of species of *Hypolimnas*. So far females of *H. carolinæ* have only been obtained, that sex of *H. nama* not having been captured in our area. The two species are undoubtedly distinct, the differences between them being well pointed out by Heer P. C. T. Snellen. They are very much rarer than is *H. nama* in the Himalayas.

146. HERONA SUMATRANA, Moore.

H. sumatrana, Moore, Trans. Ent. Soc. Lond., 1881, p. 308; id., de Nicéville, Journ. A. S. B., vol. lxiii, pt. 2, p. 5, n. 4, pl. iii, fig. 7, *female* (1894).

Moore. Grose Smith. Originally described from Sumatra. As also in all other localities the Sumatran species of *Herona* is very rare. In Deli it occurs from Selesseh to Bekantschan in March, July and September, but only four or five specimens a year will be obtained by all our collectors put together. On the wing it looks like an *Euthalia* and has a similar flight, though it has the habit of settling on tree trunks which *Euthalias* seldom or never do except when sucking up the juice from a wound in the bark.

147. PRECIS IPHITA, Cramer.

Snellen. Hagen.

148. PRECIS IDA, Cramer.

Hagen. Semper. Both species of *Precis* are found throughout our area and all the year round in ever following generations. *P. iphita*, Cramer, is somewhat the rarer, and is restricted to forests both large and small, whereas *P. ida* is found more in open ground, mostly near houses, in gardens, and in orchards, but never in forest. There are no intermediate gradations between these two species in Deli. They have a stronger and bolder flight than the species of *Junonia* which follow.

149. JUNONIA ALMANA, Linnæus.

Snellen as *asterie*. Grose Smith as *asterie*. Hagen as *asterie*. Distant as *asterie*. In my opinion *J. almana* and *J. asterie*, both of Linnæus, are one and the same species, the former being the dry-season non-ocellated, the latter the wet-season ocellated form. Only the latter is found in Sumatra, which accounts for that name being used by all authors in recording it from the island. As, however, *almana* is the older name for the species, it has to be used, though it was applied to the dry-season form. It is common in Sumatra on open grassy places, near houses and ditches, but is never found in the forest. Dr. Martin once found the larva on a small, low, white-flowering, labiate plant.

150. JUNONIA ATLITES, Linnæus.

Snellen as *laomedia*. Hagen as *laomedia*. Distant. Quite as common in Deli as the preceding species, and found from close to the sea to the Central Plateau, specimens from the hills being richer in colour with blacker margins than those from the plains. It is very fond of water, near which, if it is running in open places or in ditches, it may always be found.

151. *JUNONIA VELLIDA, Fabricius.

Grose Smith. Kirby. This species occurs only in Australia, as far as I am able to ascertain. Its record from Sumatra by the authors cited is probably erroneous.

152. JUNONIA OCYALE, Hübner.

Snellen as *orythia* [sic] and *orithyia*. Hagen as *orithya* [sic]. Semper. Staudinger as *wallacei*. *J. ocyale* is a local race of *J. orithyia*, Linnæus, a very widely spread and variable species. I agree with Herr Georg Semper (Schmett. Philipp., p. 120, n. 142) that *J. wallacei*, Distant, described from the Malay Peninsula and Java, is a synonym of *J. ocyale*. Mr Distant does not venture to say how the two species are supposed to differ. Even in a restricted area like Sumatra this butterfly shows variations within certain limits, and is more pronounced in the female than in the male. It is found over the whole of our area, but not too near the sea; it is very fond of small grassy spots, where it often abounds, and where also the rarer female may be captured. It is very restless, often settling, but only remaining for a very short time when it again takes a short quick flight, so that it is not easily caught. Dr. Hagen reports seeing it in large numbers in the short degenerated lalang-grass of the Central Plateau.

153. NEPTIS (*Rahinda*) HORDONIA, Stoll.

Grose Smith as *hordona* [sic]. Hagen. Distant.

154. NEPTIS (*Rahinda*) PARAKA, Butler.

Grose Smith as *peraka* [sic]. Hagen as *peraka* [sic]. Staudinger as *peraka* [sic]. Dr. Staudinger considers the *N. dahana*, Kheil, from Nias island, to be a synonym of this species.

155. Neptis tiga, Moore.

Butler. Staudinger as *tiga* and *dorelia.* I have a very long suite of specimens of this species, and after careful comparison have come to the conclusion that *N. dorelia*, Butler (1877), *N. sattanga*, Moore (1881), and *N. kuhasa*, de Nicéville (1886), are all synonyms of *N. tiga*, Moore (1858). To this list will probably have to be added *Rahinda* [sic] *siaka*, Moore, Trans. Ent. Soc. Lond., 1881, p. 311, described from Sumatra, as the description agrees exactly with some specimens of *N. tiga* I possess from Perak in the Malay Peninsula and Sumatra. The variation observable in *N. tiga* is obviously mainly due to season, the dry-season form being sparsely banded with black on the underside, the wet-season form heavily so. Of the three small yellow *Neptes*, *N. hordonia* is the commonest, whereas *N. paraka* and *N. tiga* are both rare, especially the latter. They all occur in large and high forest, but are most frequently found on the boundaries of the forest, or just within the borders, where there is considerable sunshine. They are very weak-flying insects, and are easily captured when at rest with wide spread wings on the leaves of low bushes and on flowers. *N. hordonia* occurs in the plains up to Bekantschan, the other two prefer higher elevations, and have been caught as high as Soengei Batoe.

156. Neptis batara, Moore.

N. batara, Moore, Trans. Ent. Soc. Lond., 1881, p. 310.

Moore. Snellen as *miah.* Originally described from Sumatra. *N. batara* has been described and figured by Distant in Rhop. Malay., p. 444, n. 13, pl. xli, fig. 14 (1886), as *N. miah*, var., from Perak. It is very doubtfully distinct from *N. miah*, Moore. Found only on the higher hills at Soengei Batoe and the Central Plateau in July, but is very rare.

157. Neptis sankara, Kollar.

Excessively rare, Dr. Martin obtained a single male from the Battak mountains in October, 1894. It is more intensely black and white than typical *N. sankara*, but the markings are similar. The *N. amba* and *N. carticoides*, both of Moore, are synonyms of this species, as probably also is *N. amboides*, Moore.

158. Neptis thamala, Moore.

N. thamala, Moore, Journ. Linn. Soc. Lond., Zoology, vol. xxi, p. 36, pl. iii, fig. 1, *female* (1886).

Originally described from Lower Burma. It is very rare in Sumatra, Dr. Martin has obtained three or four specimens only, one of which from Namoe Oekor is in my collection, taken in October.

159. NEPTIS VIKASI, Horsfield.

Hagen as *vikasi*, Moore [sic]. Butler. Staudinger. A common species in the plains, but restricted to forest.

160. *NEPTIS OMERODA, Moore.

N. omeroda, Moore, Proc. Zool. Soc. Lond., 1874, p. 571.

Grose Smith as *ormeroda* [sic]. Originally described from Penang in the Malay Peninsula. Mr. Distant considers it to be a synonym of *N. vikasi*, Horsfield. Mr. Moore describes it as being "a much blacker insect both above and below" than that species. It is unknown to us.

161. *NEPTIS HARITA, Moore.

Staudinger. It is quite probable that this species does occur in Sumatra, though Dr. Martin has never obtained it. Though quite distinct it may easily be overlooked, as it is very similar to *N. vikasi*, Horsfield.

162. NEPTIS ANJANA, Moore.

Is by far the most beautiful *Neptis* of our area, especially the underside of both wings, which exhibit very splendid colours. Is found only in the hills as high or even higher than the Central Plateau, 3,000 feet. Dr. Martin possesses three specimens only, the first obtained in 1894, after twelve years' collecting.

163. NEPTIS LEUCOTHOE, Cramer.

Snellen as *aceris*. Hagen as *aceris*. Certainly the commonest species of the genus in Sumatra, and found almost everywhere all the year round. *N. aceris*, Lepechin, of Europe, appears to me to be distinct from the present species, as it has the white bands on the underside of both wings not outwardly defined with black as they invariably are in both the wet- and dry-season forms of *N. leucothoë*—the latter form not found in Sumatra.

164. *NEPTIS PAPAJA, Moore.

N. papaja, Moore, Proc. Zool. Soc. Lond., 1874, p. 570.

Moore. Kirby. The description of this species agrees with specimens I have identified as *N. leucothoë*, Cramer, the ground-colour of the underside being "ferruginous-yellow; markings prominent, black-bordered." It was described from Sumatra. This adds one more to the twelve synonyms of *N. leucothoë* given by me in "The Gazetteer of Sikhim," p. 137 (1894).

165. NEPTIS NATA, Moore.

Grose Smith. Hagen. A common species in the plains. It is a little variable, in typical specimens the discal white band on the underside of the hindwing ends on the costal nervure, in others it ends on the first subcostal nervule. I greatly doubt if the *N. gononata*, Butler, from Malacca, is distinct from this species.

166. NEPTIS DURYODANA, Moore.

Grose Smith as *duryodama* [sic]. Snellen. A common species of the plains in October.

167. *NEPTIS NADINA, Moore.

Grose Smith as *soma*. *N. soma*, Moore, is a synonym of *N. nadina*, Moore. It is probable that Mr. Grose Smith identified this species from specimens similar to those which I subsequently described as *N. clinioides*.

168. NEPTIS CLINIOIDES, de Nicéville.

N. clinioides, de Nicéville, Journ. A. S. B., vol. lxiii, pt. 2, p. 6, n. 5, pl. i, fig. 8, *male* (1894).

Very rare, a few specimens only have been obtained in the Battak mountains and Central Plateau in June.

169. NEPTIS SUSRUTA, Moore.

Grose Smith. A common species in the low forests.

170. *NEPTIS HELIODORA, Cramer.

Hagen. Probably a wrong identification. It was described from Amboina, and is apparently confined to the Moluccas.

171. NEPTIS OPHIANA, Moore.

Hagen as *ophiana*, var.? Very rare, Dr. Martin has obtained a single specimen. Herr Georg Semper places this species and its allies in the genus *Phædyma*, Felder, of which *N. heliodora*,* Cramer, is the type (Schmett. Philipp., p. 142 (1889). With the exception of *N. sankara*, Kollar, *N. clinioides*, de Nicéville, and *N. ophiana*, Moore, all the black species of *Neptis* are common insects, occurring everywhere in open places, both in small jungle and in large forest, except *N. susruta*, Moore, and *N. nata*, Moore, which are restricted to the latter. Of the *Nymphalinæ* the species of this genus are earliest on the wing, and do not appear at all to mind the leaves being wetted with rain or dew. After a shower they will appear immediately, and even fly when there is no sun. Wherever there are a few trees or bushes along the roads, in gardens, and in fact practically everywhere they may be found, weakly sailing about and frequently settling; apparently highly protected as they shew no fear whatever.

172. CIRRHOCHROA ORISSA, Felder.

Grose Smith. Hagen. In the male on the upperside of the forewing the first median nervule and submedian nervure, and the subcostal nervules of the hindwing are for some distance on both sides defined by a fine ochreous line, the veins themselves being black. Occurs only in forest, but not at high elevations, not higher than Namoe Oekor; very common at Selesseh in June and August.

173. CIRRHOCHROA SATELLITA, Butler.

Hagen. The male has no secondary sexual characters. It is rarer than *C. orissa*, Felder; occurs only in forests, and at still lower elevations in July. It is weaker on the wing than that species.

174. CIRRHOCHROA CLAGIA, Godart.

Snellen. Distant. In the male on the upperside of both wings the veins where they cross the disc are more or less black, and in the forewing they are defined on both sides with ochreous for a short distance on entering the broad black marginal border. Occurs only at elevations over 1,000 feet, higher than Namoe Oekor, found at Bekantschan and Soengei Batoe in May, July, and September. Is the rarest of all the species of *Cirrhochroa* occurring in Sumatra.

175. CIRRHOCHROA BAJADETA, Moore.

Snellen. Hagen. The male has no secondary sexual characters. Is found everywhere in October in forest, and also in places where a small piece of the original forest has been left, as does *Cupha erymanthis*, Drury. The males are prone to visit damp spots on roads.

176. CIRRHOCHROA MALAYA, Felder.

Hagen. Wallace. Mr. Distant remarks that "Specimens will be obtained of a completely intermediate character between *C. bajadeta* and *C. malaya*." I have seen none such in Sumatra, in fact, *C. malaya* appears to me more nearly allied to *C. mithila*, Moore, than to

C. bajadeta, the male differing from that sex of the former on the upperside of the forewing in having a broad black marginal border instead of three waved black lines, and in the hindwing in having the inner of the three marginal black lines discontinuous instead of continuous. The secondary sexual characters of the male consists in some specimens (absent in others) of the fifth subcostal and upper discoidal nervules of the forewing on the upperside on entering the apical black margin being defined on both sides by a narrow line of ochreous. It is much rarer than *C. bajadeta*, and occurs in the same localities, but is not found higher than Namoe Oekor. The female is unknown to us.

177. CIRRHOCHROA MITHILA, Moore.

Hagen as *aoris*. *C. aoris*, Doubleday and Hewitson, is confined to the Eastern Himalayas, Assam, and Upper Burma, Dr. Hagen's identification probably applies to the present species. It is somewhat rare, and found in forests at low elevations. The male has no secondary sexual characters.

178. CIRRHOCHROA (*Paduca*) FASCIATA, Felder.

Wallace. Staudinger. Kirby. Semper. I have fully described the male secondary sexual characters of this species in Butt. of India, vol. ii, p. 109. It is the smallest and weakest-flying species in the genus, inhabits forest, and is always somewhat rare. It is found from near the sea to the mountains as high as Bekantschan. In 1890 Dr. Martin found it unusually plentiful at the Saentis Estate near the sea, where a flowering tree was daily covered, so long as the flowers lasted, with this species, and on two occasions he captured more than forty quite fresh specimens.

179. STIBOCHIONA KANNEGIETERI, Fruhstorfer.

S. kannegieteri, Fruhstorfer, Ent. Nach., vol. xx, p. 305 (1894).

Snellen as *coresia*. Grose Smith as *coresia*. Hagen as *coresia*. Staudinger as *coresia*. Kirby as *coresia*. Originally described from Sumatra and Borneo. Very near to *S. coresia*, Hübner, from Java, (from whence also Herr H. Fruhstorfer has described *S. rothschildi*), that species in the male on the upperside of the hindwing having a series of submarginal white spots which are absent in the Sumatran species, and in the female having a broad white marginal band which in the Sumatran species is replaced by a series of white spots similar to the male of *S. coresia*. Occurs in our area from the lower hills to the Central Plateau, is not common, and is seldom procured in perfect condition. The lowest localities where Dr. Martin has caught it are Namoe Oekor in Langkat, and Kotta Lembaroe in Deli. It settles on trees not very high from the ground with widespread wings, and behaves on the wing like an *Euthalia*.

180. HYPOLIMNAS BOLINA, Linnæus.

Snellen. Hagen as *bolina* and *jacintha*. Wallace. Staudinger as *bolina*, var. *jacintha*. Distant. Extremely variable in the female sex, many of them being of the form named *jacintha* by Drury. But none of the forms described by Cramer from Java which are more or less richly marked with ochreous on the upperside, such as *iphigenia*, *melita*, *alcmene*, *antigone*, and *proserpina* are found in Sumatra. In Deli it is rather rare, and prefers low elevations, not being found higher than Namoe Oekor. It is more plentiful near the sea, as at the Saentis Estate and at Mabar Dr. Martin could obtain one or two specimens nearly every day. Only in December, 1892, and January, 1893, it appeared in large numbers and all varieties of the female near Bindjei, but in the following year there was not a single specimen to be seen. It does not frequent forests, but is found on roads, in gardens, and near houses.

181. HYPOLIMNAS ANOMALA, Wallace.

Grose Smith. Snellen as *antilope*. Hagen. Semper. The *H. antilope* of Cramer described from Amboina appears to be a distinct species, and is recorded by Wallace from Amboyna, Ceram, and Bouru. In our area *H. anomala* becomes year by year more scarce, in correlation with the disappearance of the forests. It does not occur at higher elevations than Bindjei. Is a highly mimetic insect, as the males very closely resemble on the wing the brown species of *Euplœa*, such as *E. moorei*, Butler, and also settle near forest roads like *Euplœas* with *folded* wings. The female is trimorphic; the first form has the upperside richly glossed with blue, and mimics the male of *Euplœa linnæi*, Moore; the second form is dull brown, lacking the blue coloration altogether, is very similar to the male, only duller and larger, and mimics the brown *Euplœas*; the third form has along the outer margin of the hindwing on both the upper and undersides a series of marginal white streaks between the veins, and may be taken on the wing for *E. pinwillii*, Butler.

182. HYPOLIMNAS MISIPPUS, Linnæus.

Snellen. Hagen. Distant. The female in Sumatrá is of the form of *diocippus*, Cramer, and is a beautiful mimic of *Danais chrysippus*, Linnæus. The form which mimics *Danais klugii*, Butler, and occurs in India and Africa, is not found in Sumatra, neither does it mimic the white aberration of *D. chrysippus*, (*alcippus*, Cramer), which is found in Sumatra, as it does in Africa. *H. misippus* is very common in Sumatra, and abounds in open places, on roads, near houses, and especially in newly-cut tobacco fields, where after the tobacco is cut down and removed there springs up a rich growth of low plants. Not found at a greater elevation than Bekantschan. Has a wide range, from Northern Australia and New Guinea on the one hand, to Florida in the United States of America on the other. Dr. Martin notes that not knowing the species in Europe and on first arrival in Sumatra he would not believe his European assistant when he brought both sexes and said they were male and female of one species. Dr. Martin dismissed him with an incredulous smile, but the next day he caught a couple paired, and then knew better.

183. ARGYNNIS NIPHE, Linnæus.

Snellen. Grose Smith. Hagen. Staudinger. Semper. Occurs only on the Central Plateau, where in some years it is found in large numbers and where Dr. Hagen captured it. Dr. Martin caught a single male specimen at Toentoengan in Deli in September, 1888, to which place this mountaineer may have been carried by a high wind. Sumatran specimens are never as large as those from Northern India, but are usually larger than the Javan form (*A. javanica*, Oberthür), which has a richer and darker coloration than the Sumatran form. The female is rarer than the male, native collectors bring it in the proportion of one to five. (For notes on this species see de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. viii, p. 153 (1893).

184. DICHORRHAGIA NESIMACHUS, Boisduval.

Hagen. Semper. Formerly by no means a rare insect in Deli and Langhat before the clearing of the forest, and occurred at low elevations, not higher than Bekantschan. Dr. Hagen before 1882 found it common in Serdang, whereas Dr. Martin, who commenced to collect in that year, obtained his first specimen in 1887 near a small river at Soengei Beras, where a small piece of forest was left. Later it was found to be more plentiful at Selesseh, also south of Namoe Oekor, and in Padang Bedagei; the Gayoe collectors again brought it in large numbers, collected in the forests on the way to their homes in the mountains. It is fond of settling on forest roads with wings only half open, and has a very rapid flight as its robust structure shews.

185. PARTHENOS GAMBRISIUS, Fabricius.

Hagen. Wallace. All the species of this genus have a very beautiful and characteristic flight, unlike any other butterfly known to me.

It is very strong on the wing, and flies over high bushes and trees, and alights on the uppersides of the leaves with open wide-spread wings. When flying it keeps the wings very level and parallel with the ground, the tips or apices of the forewings slightly depressed, it flaps the wings but seldom, and is much given to soaring. The Sumatran form is the one which has been named *P. lilacinus* by Butler, and has a patch on the internal area of the forewing and the basal area of the hindwing on the upperside marked with lilac. In our area it occurs all the year round at low elevations, not as high as Namoe Oekor, is not rare, but is not easy to capture. Is found not only in high forest, but also in small strips of forest and jungle always accompanying the smaller streams. Is very fond of and is only found near water. In a boat journey up the Bedagei River, both banks of which were covered with the flowers of a snow-white lily, Dr. Martin noticed *P. gambrisius* settling in considerable numbers on the flowers; a beautiful sight for a lover of nature. At the Batoe Mandi Estate on the high bank of the Wampoe River are planted a few male papaya trees (which of course bear only flowers and no fruit), and on these flowers the Javan collector Saki captured a very fine series of specimens.

186. LEBADEA MARTHA, Fabricius.

Limenitis martha, Butler, Cat. Fab. Lep. B. M., p. 59, n. 1, pl. i, fig. 4, *male* (1869).

Lebadea alankara, Horsfield (*martha*, Fabricius ?), var. *sumatrensis*, Staudinger, Ex. Schmett., p. 142 (1886).

Hagen. Butler as *alankara* and *martha*. Kirby. Distant. Staudinger as *alankara*, var. *sumatrensis*, and *martha*, var. *sumatrensis*. Fabricius described this species from Siam; Butler says the type is in the Banksian collection at the British Museum, he figures the species, and records it from Sumatra. Not having any Siamese specimens of *Lebadea* to compare with Sumatran ones, I accept Butler's identification; but should the Siamese and Sumatran species be found afterwards to differ, Staudinger's name *sumatrensis* must stand. The genus is a small one, and contains *L. ismene*, Doubleday and Hewitson, from Sikhim, Bhutan, Assam, and Upper Burma, which gradually merges into *L. attenuata*, Moore, from Lower Burma, which again meets *L. martha*, Fabricius = *L. alankara*, Horsfield, in the Malay Peninsula, found also in Sumatra, Java and Banca; another species being *L. paduka* (nec *L. panduka*, Staudinger), Moore, from Borneo. Butler in Trans. Linn. Soc. Lond., Zoology, second series, vol. i, p. 565 (1877) gives both *L. alankara* and *L. martha* from Sumatra, it is hardly probable that two distinct species occur in one island, and, as will be seen above, I consider those two names to represent one species. In our area it occurs from

Selesseh to Namoe Oekor, and as high as Soengei Batoe; is a true butterfly of the forest, settles on leaves with spread wings, and has a decidedly weaker flight than *Limenitis* and *Euthalia*. The sexes differ very much in size, the female being always much larger than the male; often extremely small males are found. It is not a common butterfly.

187. LIMENITIS ALBOMARGINATA, Weymer.

L. albomarginata, Weymer, Stet. Ent. Zeit., vol. xlviii, p. 5, n. 3, pl. ii, fig. 2, *male* (1887).

L. albomarginata, Martin, Einige neue Tagschmetterlinge von Nordost-Sumatra, pt. 2, p. 7, n. 7 (1895).

L. hageni, Staudinger, Iris, vol. v, p. 452 (1892); idem, id., l.c., vol. vii, p. 342 (1894).

Padang, West Sumatra, Weymer. Staudinger. This species is a very distinct local race of the Himalayan and Assamese *L. danava*, Moore. It occurs only in Sumatra, and in our area is found only on the Central Plateau, from whence every year a large number of males were brought by the collectors, once only a single female, which Dr. Martin has described (l. c.). As the sexes of this as well as of other butterflies are produced in about equal numbers, it shews clearly the skulking habits of the female that it should be so excessively rare in collections. The same sex of *L. danava* is almost equally rarely seen in India.

188. LIMENITIS DARAXA, Doubleday and Hewitson.

Doherty records this species from Larut Hill, Perak, Malay Peninsula, and describes *L. agneya* from the same hill, but found at 3,000 feet lower elevation (Journ. A. S. B., vol. lx, pt. 2, p. 176 (1891). *L. daraxa* is much rarer in our area than the preceding species, and occurs in the same locality. Never more than two or three specimens are captured in one year.

189. LIMENITIS BOCKII, Moore.

L. bockii, Moore, Trans. Ent. Soc. Lond., 1881, p. 308.

Moore. Hagen as *dudu*. Grose Smith as *dudu* and *bockii*. Moore describes this species from Sumatra, and as allied to *L. dudu*, Westwood, from North-Eastern India, differing in being smaller, with a broader transverse white band. The size is unimportant, I possess smaller specimens of *L. dudu* than of *L. bockii*; but the discal band is certainly broader, especially so on the forewing. The rarest of all the species of *Limenitis* in our area, of which Dr. Martin has received during all the period he was in Sumatra not more than ten specimens, nearly all of which were captured near Kampong Naman and Kampong Beras Tepoe on the Central Plateau. Mr. Grose Smith's record of both *L. dudu* and *L. bockii* from Sumatra is almost certainly incorrect.

190. LIMENITIS (*Moduza*) PROCRIS, Cramer.

Hagen. Distant. A common species everywhere, but not found higher than Bekantschan, as the food-plant of the larva does not grow at the higher elevations. The butterfly is fond of wet places and fæces on roads, to which it always returns after being disturbed. If pursued it retires for a short time into the jungle, and settles on the leaves. It is never met with in large forest.

191. PANDITA SINOPE, Moore.

Hagen. Is now very rare in Deli at low elevations, occurs in Dr. Martin's fruit garden at Bindjei and at Selesseh, but never at a higher elevation. In the time before so much of the forest had been destroyed for tobacco cultivation in Deli it was more common, and always shewed a preference for small forest or the boundaries of large forest, seldom found within the precincts of the latter.

192. ATHYMA PERIUS, Linnæus.

Hagen as *perius*, Aurivillius [sic]. Snellen as *leucothoë*. Common everywhere from near the sea and extending to the Central Plateau. This species also was very plentiful before the advent of the tobacco cultivation, but is now somewhat rare in those districts. As soon as these are left behind it appears everywhere on roads and the margins of small forest. It is doubtless a good mimic of our commonest species of *Neptis*, *N. leucothoë*, Cramer, together with which it is always found, and from which it is not easily differentiated on the wing, but, if pursued, it at once assumes its stronger and bolder proper *Athyma*-like flight. Occurs also at Asahan and in the Gayoe-lands.

193. ATHYMA LARYMNA, Doubleday and Hewitson.

Grose Smith. Snellen. The largest of all our *Athymas*, occurs all over our area with the exception perhaps of the Central Plateau. Is decidedly rare, and always found only singly on fæces and moist spots on forest roads. Every year Dr. Martin captured two or three specimens on the muddy banks of the Soengei Diski River near Paya Bakong.

194. ATHYMA IDITA, Moore.

Grose Smith. Has the same range and occurs in similar places as *A. larymna*, Doubleday and Hewitson, but is very rare. In consequence of the beautiful coloration and markings of the underside it is a conspicuous insect when at rest with folded wings.

195. ATHYMA KANWA, Moore.

Snellen. Very rare, more so than the two foregoing species. Found from Bekantschan to Soengei Batoe. Dr. Martin has never seen it on the wing.

196. ATHYMA PRAVARA, Moore.

Butler. Distant. A commoner species than those mentioned above. Occurs in forests in the plains and as high as Namoe Oekor. It is the smallest of our *Athymas*, and is easy to recognise by the club-like streak with rounded end in the discoidal cell of the forewing.

197. ATHYMA RETA, Moore.

Moore as *reta* and *kresna*. Grose Smith as *reta* and *kresna*. Hagen as *reta*, var. ? Kirby. Distant as *kresna*. Butler as *kresna*. Moore described both *A. reta* and *A. kresna* from Sumatra on the same page and figured both. He figures *reta* with all the spots and bands of the upperside pure white ; *A. kresna* with all the markings pale blue except the submarginal band of the hindwing which is white. The markings are precisely similar except that in *A. reta* they are somewhat larger. I have no hesitation whatever in considering these two supposed distinct species to be one and the same, the differential characters given to distinguish them being in my opinion quite non-specific, being based on characters which are obviously variable. The blue coloration of *A. kresna* is almost certainly incorrect. In one place Mr. Moore speaks of the markings as "bluish-white," and in another as "white." It is a common species in Borneo, and occurs also in Lower Burma and the Malay Peninsula. Mr. Moore has suggested that *A. subrata*, Moore, may be a dimorphic form of the female of *A. kresna* = *A. reta*, the ordinary female of which has reddish markings. I possess only males of *A. kresna*, so have no idea what its female is like. *A. subrata* is quite distinct from *A. kresna*, see No. 199, that species being a local race of *A. nefte*, Cramer ; *A. subrata* cannot therefore be the female of *A. kresna*. Together with *A. perius*, Linnæus, and *A. subrata*, Moore, this is the commonest species of the plains, and is met with on nearly every road leading through high forest. The pupa is very richly decorated with gold as usual in the genus.

198. ATHYMA ABIASA, Moore.

Grose Smith. This rare and beautiful species occurs at Soengei

Batoe, 3,000 feet, and even higher. It is easily recognised by the fine white lines before and beyond the large white spot at the end of the discoidal cell of the forewing.

199. ATHYMA AMHARA, Druce.

Limenitis selenophora, Snellen (*nec* Kollar), Midden-Sumatra, Lepidoptera, p. 15, n. 1, pl. i, figs. 4, 5, *male* (1892).

Snellen as *selenophora*. Is a local race of *A. selenophora*, Kollar, that species occurring in the Himalayas, Bhutan, Assam, Tavoy in Burma, and Java. The present species is found in the Malay Peninsula, Sumatra, and Borneo. The male differs only from *A. selenophora* in having a submarginal or outer-discal pure white macular instead of a very obscure pale fuscous fascia on the upperside of the hindwing. The females of the two species are indistinguishable. It is the commonest species of *Athyma* of the higher mountains and the Central Plateau, especially plentiful in December and January; found also in Indragiri.

200. ATHYMA SUBRATA, Moore.

Grose Smith as *subrata* and *nefte*. Hagen as *nefte*. Standinger as *nefte*. Distant. We have here to do with a very interesting group of species. In Sikhim, Bhutan, Assam and South India the male is much marked on the upperside with yellow, and is the *A. inara* of Doubleday and Hewitson (= *inarina*, Butler). This species gradually merges in Burma into *A. asita*, Moore, specimens absolutely intermediate between *A. asita* and *A. inara* occurring. Further south in the Malay Peninsula, Sumatra, Nias, and Borneo *A. subrata* (= *nivifera*, Butler), occurs. The characters given by Butler to distinguish it from *A. nefte*, Cramer, hold good, so it may be accepted as a good local race. In Java *A. nefte* alone occurs. *A. rufula*, de Nicéville, from the Andaman Isles, and *A. glora*, Kheil, from Nias, are distinct species. *A. inara* and *A. asita* have one female only, which is yellow. *A. subrata* has two females, the one is yellow, the other is brown. It was described from the brown form of female, its male is the *A. nivifera* of Butler. *A. nefte* is also dimorphic, one form being yellow the other brown. The two females of *A. subrata* and the two of *A. nefte* cannot be distinguished, the males alone are different, and the species are kept distinct by me on the male sex alone. *A. rufula* appears to have only one form of female. As noted above, this is a common species of the plains, not occurring higher than Namoe Oekor. The males are found on forest roads, the females inside the forest, of which latter the brown form is less rare than the yellow. The brown form almost certainly mimics *Neptis vikasi*, Horsfield, but there is no large yellow *Neptis* in our area that the yellow form could mimic, though, as Doherty has remarked, size is probably not an insuperable bar to mimicry, as the vertebrate enemies of insects probably think that insects in the perfect state grow as they do themselves, so that our large yellow female *Athyma* probably does mimic the smaller yellow species of *Neptis*, such as *N. hordonia*, Stoll.

201. ATHYMA ASSA, de Nicéville.

A. assa, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. viii, p. 42, n. 5, pl. K, fig. 8, *male* (1893).

Occurs at the same localities and elevations as *A. amhara*, Druce, but is much rarer. It is a beautiful species, of which the first specimens were obtained in 1892.

202. EUTHALIA (*Dophla*) DERMA, Kollar.

Hagen. A very fine, large and rare species which is found from near the sea to the elevation of Bekantschan. It is, like the rare species of *Charaxes*, *Prothoë*, and also *Athyma larymna*, Doubleday and Hewitson, only met with singly or in pairs. Dr. Martin obtained his first pair in 1887 near Toentoengan at a place in a large forest where a Chinese carpenter was sawing wood, and the two butterflies were feeding on the wet sawdust. Dr. Martin possesses specimens from Stabat on the Wampoe River, and from Boekit Mas on the Besitan River. He is under the impression that like a pair of tigers or large birds of prey, which keep a large area of country solely for their own use and benefit and do not allow any other individuals of the same species to intrude into this area, that the above-named large and rare butterflies—but only in the subfamily *Nymphalinæ*—behave similarly, as there are never found more than one or two specimens of each over a large area. The reason for this Dr. Martin is quite unable to explain.

203. EUTHALIA (*Dophla*) DUNYA, Doubleday and Hewitson.

Hagen. Even rarer than *E. derma*, Kollar. Dr. Martin only possesses two specimens, one from Bekantschan, and one from Kampong Singhapura, five miles south of Namoe Oekor, so is probably in Sumatra confined to the outer hills. It is very common in S.-E. Borneo.

204. EUTHALIA (*Dophla*) EURUS, de Nicéville.

E. (*Dophla*) *eurus*, de Nicéville, Journ. A. S. B., vol. lxiii, pt. 2, p. 15, n. 13, pl. ii, figs. 3, *male* ; 4, *female* (1894).

Of all the *Euthalias*, this species approaches nearest to the sea, as Dr. Hagen has captured it near Laboean, and Dr. Martin both sexes in the forest between the Saentis Estate and the sea. Found not higher than Bindjei or Selesseh. Both sexes are rare, especially the female.

205. EUTHALIA (*Lexias*) DIRTEA, Fabricius.

Hagen. Grose Smith. Butler. Distant. Was a very common species in Deli before the extension of the tobacco cultivation destroyed nearly the whole of the forests; it occurred round nearly every house, and both sexes were easily captured on the kitchen-midden, especially on discarded fragments of fruit thrown out by the Chinese cook. Still very common behind the house of the manager of the Tandjong Djatti Estate, where there is still left a small forest of teak ("djatti" in Malay) trees. Occurs from November to March, never in high virgin forest, not at a greater elevation than Bekantschan. The female is called "The golden-spot butterfly" by Europeans in the Straits Settlements. It settles with wide open-spread wings, at least when feeding. Dr. Dohrn has bred it at Soekaranda. Males of this species from the mountains are on the underside of both wings far darker than specimens from the plains, and a little bluish in hue.

206. EUTHALIA (*Lexias*) PARDALINA, Staudinger.

Symphædra pardalina, Staudinger, Ex. Schmett., p. 154, pl. liv, *male* [as *pardalis*, Staudinger] (1886).

A remarkable species, the male and female being alike, and very similar on the upperside to the female of *E. dirtea*, Fabricius, while the male of *E. dirtea* is entirely different from its female, and is therefore quite dissimilar from that sex of *E. pardalina.* It is very rare, and occurs only at higher elevations, at Soengei Batoe and on the Central Plateau, where *E. dirtea* is never found.

207. *EUTHALIA (*Lexias*) CYANIPARDUS, Butler.

Dr. Hagen informs us that he has himself captured a male of this species (which has already been recorded from Borneo) near the Saentis Estate in Deli, and has obtained females by his collectors from Western Sumatra.

208. EUTHALIA (*Felderia*) COCYTUS, Fabricius.

Vollenhoven as *ludekingii*, described from Sumatra, and *blumei*. Felder, as *mitra* described from Sumatra and Banca. Snellen as *blumei*. Hagen as *blumei*, *ludekingii*, and *cocytina*. Grose Smith as *cocytina* and *diardi*. Butler as *ludekingii*. Staudinger as *blumei*. Semper as *ludekingii*. Kirby as *cocytina* and *ludekingii*. Distant as *cocytina*. Five species of the subgenus *Felderia* have been recorded from Sumatra by different writers as enumerated above. To these names might be added *E. stoliczkana*, Distant, *E. maclayi*, Distant, and *E. puseda*, Moore, given by Mr. Distant in "Rhopalocera Malayana" from the Malay Peninsula.

Other probable synonyms are *E. gopia*, Moore, *E. godartii*, Gray, described from Sumatra, and *E. monina*, Fabricius. During the time Mr. W. Davison of the Singapore Museum was alive he devoted much time and pains to no purpose in trying to separate into distinct species the many forms recorded by Mr. Distant from the Malay Peninsula, and to this end captured many hundreds of specimens of both sexes, numbers of which he sent to me. In the forests of Sumatra this protean species is equally common, and Dr. Martin has obtained both sexes in large numbers. He and I have quite failed to split them up into separate species. Dr. Staudinger appears also to have succeeded no better. Both sexes are variable, but it is in the female that the variations are the greater and more puzzling. It is quite easy to assign names in accordance with described species to the more conspicuous varieties, but when one comes to arrange large series of specimens one finds how impossible it is to divide them into separate species. The only solution of the difficulty in splitting up this species appears to lie in extensive breeding from the egg. Even supposing the male primary sexual organs should on microscopical examination disclose specific differences, the difficulty will only be half got over, as the question of pairing the females with the males found to represent distinct species will be quite hopeless till both are bred. I have adopted the oldest name for the group. Dr. O. Staudinger has taken the next oldest name, which is the "*Papilio*" *monina*, also of Fabricius. *E. cocytus* is the commonest species of *Euthalia* occurring in our area, and is found everywhere except on the Central Plateau. The males are very easily damaged, and seldom found in collections in an absolutely perfect state. The male is doubtless mimicked on the wing by the males of *Stibochiona kannegieteri*, Fruhstorfer.

209. EUTHALIA (*Felderia*) ASOKA, Felder.

Snellen. This species was originally described from a female from "Malacca interior" and Borneo; Distant records it from Penang, Province Wellesley, and Malacca. He figures both sexes, and associates with the very distinct female a male with the apex of the forewing rather more produced than in the males of the other species of the group he retains as distinct species, and with the underside of both wings unusually dark, with a broad outer pale margin to the forewing. At the earnest request of Dr. Martin I retain this species as distinct from *E. cocytus*, Fabricius, but it is against my better judgment to do so. The female is typically very distinct, as it has on the upperside of the forewing a prominent band of seven sullied white spots, the anteriormost sometimes divided into two spots, but joined in both Felder's and Distant's figures; the two posteriormost spots in the submedian interspace somewhat small, placed one above the other; between this macular whitish band and the outer margin is a diffused broad pale blue fascia. I find, however, in my large series of females of this group, that these apparently good and distinct characters are not constant, and that it is well nigh impossible to differentiate this form satisfactorily. Mr. Distant's sexing of the species is probably purely guess work, and cannot be accepted finally without some good proof, such as taking the two sexes paired or breeding both from the egg. It is possible that *E. macnairi*, Distant, is a distinct species and is the same as *E. andersonii*, Moore, in which case Distant's name has a year's priority. Dr. Martin notes that *E. asoka* is the rarest species of the group occurring in our area, and that it is found at higher elevations than the others, not lower than Bekantschan.

210. EUTHALIA (*Tanaëcia*) VIKRAMA, Felder.

Felder. Grose Smith as *pulasara*. Butler as *pulasara*. Hagen as *pulasara*, var. ? Kirby. Distant. Originally described from Sumatra. This is a local race of *E.* (*Tanaëcia*) *pulasara*, Moore, from the Malay Peninsula, but is sufficiently different to be retained as a distinct species. Not rare in the plains of Sumatra.

211. *EUTHALIA (*Tanaëcia*) PELEA, Fabricius.

Snellen. Grose Smith as *palguna*. As far as I am aware, this species is confined to Java, from whence I possess specimens of both sexes. Mr. Moore has figured the male as "*Adolias*" *palguna*, Moore, which is a synonym of *E. pelea*.

212. *EUTHALIA (*Tanaëcia*) SUPERCILIA, Butler.

Grose Smith. Originally described from Penang. Mr. Butler has figured a male. It is entirely unknown to us.

213. EUTHALIA (*Tanaëcia*) PHINTIA, Weymer.

Tanaëcia phintia, Weymer, Stet. Ent. Zeit., vol. xlviii, p. 7, n. 5, pl. i, fig. 6, *male* (1887).

Weymer. Grose Smith as *aruna*. Originally described from Sumatra. This species is a local race of *E.* (*Tanaëcia*) *aruna*, Felder = "*Adolias*" *pardalis*, Vollenhoven, from the Malay Peninsula and Java, but is easily separable from that species. Rather rare, and only occurs at higher elevations and south of Namoe Oekor, at Bekantschan and Soengei Batoe.

214. Euthalia (*Tanaëcia*) martigena, Weymer.

Tanaëcia martigena, Weymer, Stet. Ent. Zeit., vol. xlviii, p. 8, n. 6, pl. i, fig. 7, *female* (1887).

Weymer. Originally described from Sumatra. Occurs in the same localities as the last, and is equally uncommon.

215. Euthalia nice'villei, Distant.

One of the rarest insects of our fauna, Dr. Martin having obtained only two specimens during the years he collected in Sumatra, and Dr. Hagen none at all. Found at an elevation of not less than 3,000 feet. It probably escapes capture by the collectors as it is so similar in general appearance to *E. cocytus*, Fabricius, and is thus often passed over for that species.

216. Euthalia (———) kanda, Moore.

Hagen. Originally described from Borneo. Dr. Martin has obtained a few specimens at Selesseh, but it is very rare.

217. Euthalia (———) elone, de Nicéville.

E. (*Tanaëcia ?*) *elone*, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. viii, p. 47, n. 7, pl. L, fig. 3, *male* (1893).

Expanse: ♀, 3·1 to 3·2 inches.

Description: Female. Differs from the male only in its larger size, paler coloration on both surfaces, and on the underside in the absence of the violet suffusion, especially on the hindwing.

A very rare species, found only on the Central Plateau in July and August. Dr. Hagen obtained this species before Dr. Martin, and sent it to London for identification, but unsuccessfully; nor was Dr. Martin more fortunate in sending it to Berlin for the same purpose somewhat later.

218. Euthalia garuda, Moore.

Vollenhoven. Hagen. Staudinger. Whilst all the species of *Euthalia* abovementioned, with the exception of *E. dirtea*, Fabricius, and also all that follow except *E. adonia*, Cramer, are more or less inhabitants of the forest, this species appears only near human habitations, as the food-plant of the larva is the leaves of the mangoe tree, which is always planted near villages and round houses. It is not found therefore at higher elevations, as that fruit tree even at Namoe Oekor does not flourish as it does in the plains. It is most plentiful in January and February, when the males may be continually seen pursuing each other from the shade of one mangoe tree to another.

219. EUTHALIA JAMA, Felder.

Hagen. Dr. Martin possesses three males only of this species, all from higher elevations south of Bekantschan.

220. EUTHALIA ERIPHYLÆ, de Nicéville.

E. eriphylæ, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. vi, p. 353, n. 7 pl. F, fig. 7, *male* (1891).

E. delmana, Swinhoe, Trans. Ent. Soc. Lond., 1893, p. 287, n. 178.

Found in the Khasi Hills; the Ataran Valley, Meplé and the Daunat Range in Middle Tenasserim, Burma; and at Bekantschan at the foot of the Battak mountains in September, but it appears to be everywhere rare. The type specimen figured and described by me appears to be the dry-season form of this species, which is not found in Sumatra, and is much paler coloured with more prominent markings than the rainy-season form.

221. *EUTHALIA ALPHEDA, Godart.

Snellen. Both sexes have been figured by Mr. Moore in Trans. Ent. Soc. Lond., New (second) Series, vol. v, p. 66, n. 6, pl. iii, fig. 4 (1858). As far as I am aware, it is confined to Java, from whence I have obtained specimens, unless, as seems probable, the *E. jama* of Distant, but not of Felder, from Province Wellesley and Malacca, is a synonym of *E. alpheda*, in which case it occurs also in the Malay Peninsula (Rhop. Malay., p. 119, n. 4, pl. xiv, fig. 8, *male*, pl. xv, fig. 4, *female* (1883).

222. EUTHALIA AGNIS, Vollenhoven.

Adolias agnis, Vollenhoven, Tijd. voor Ent., vol. v, p. 202, n. 27, pl. xii, fig. 2, *female* (1862).

Euthalia agnis, Fruhstorfer, Berl. Ent. Zeit., vol. xxxix, p. 245, pl. xviii, fig. 8, *male* (1894).

Recorded from Java by Vollenhoven and Fruhstorfer. In Sumatra it is only found in the Battak mountains from June to August, and is very rare.

223. EUTHALIA MERTA, Moore.

Grose Smith. Originally recorded from China by Mr. Moore, but probably in error. It is found in the Malay Peninsula and at Selesseh in Sumatra, but is excessively rare everywhere.

224. EUTHALIA SAKII, de Nicéville.

E. sakii, de Nicéville, Journ. A. S. B., vol. lxiii, pt. 2, p. 9, n. 8, pl. iii, fig. 3, *female* (1894).

The type is unique, and Dr. Martin says came from Selesseh.

225. *EUTHALIA PARTA, Moore.

Hagen. Originally described from Borneo. Unknown to us.

226. EUTHALIA ? ZICHRI, Butler.

Originally described (but not figured) from Sarawak in Borneo. Distant describes and figures it from Malacca, but neither figure or description exactly agrees with Butler's description of the species. Nor do our Sumatran specimens agree much better with the type or the Malacca example. We have here to do either with one very variable species, or several local races. A considerable series from various localities is required to settle the point. In Sumatra it is exceedingly rare, Dr. Martin has obtained two or three specimens only from the mountains.

227. EUTHALIA ANOSIA, Moore.

Hagen. Everywhere rare throughout its considerable range of habitat. Dr. Martin possesses a single specimen from Kampong Singhapura, south of Namoe Oeker, captured in April, 1891. Besides this specimen Dr. Martin caught another himself at Ayer Panas, 18 miles inland from the town of Malacca, and near the spot where Dr. A. R. Wallace, F. R. S., captured the type of *Prothoë calydonia*, Hewitson, and a third in April, 1895, at the lower end of the Jibi Kola, near Darjiling, in the eastern Himalayas, all these specimens from widely separated localities are precisely similar.

228. EUTHALIA LUBENTINA, Cramer.

Hagen as *lubentina*, Horsfield and Moore [sic]. A rare species in Sumatra as elsewhere. Occurs at higher elevations in Sumatra, at Soengei Batoe and in the Gayoe mountains. Dr. Martin obtained one pair at Kotta Lembaroe in Deli in 1888.

229. EUTHALIA ADONIA, Cramer.

Vollenhoven. Hagen as *adonia*, Horsfield and Moore [sic]. Grose Smith as *adoma* [sic]. Staudinger. Very rare, Dr. Martin has obtained a single female. It seems to occur at the same elevations and localities as *E. garuda*, Moore, and the larva probably feeds on the same tree (mangoe). The specimen now in Dr. Martin's collection was caught by himself on a small mangoe tree behind the Chinese merchant's house near the Battak resthouse in Bindjei town. He saw a second in June, 1894, also on a mangoe tree in the garden of the Loboe Dalam hospital, but as he was on duty, he could not secure it. He has never seen a male.

230. EUTHALIA (*Nora*) RAMADA, Moore.

Hagen. Not very common, found from Selesseh to Bekantschan.

231. EUTHALIA (*Nora*) DECORATA, Butler.

Originally described as *Adolias decoratus* from Singapore, and both sexes figured by Butler.

232. EUTHALIA (*Nora*) ERANA, de Nicéville.

E. (*Nora*) *erana*, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. viii, p. 46, n. 6, pl. L, figs. 1, *male*; 2, *female* (1893).

Snellen as *salia*. Hagen as *salia*. The *E.* (*Nora*) *salia* of Moore is quite distinct from the present species, and is confined to Java, from whence I possess both sexes. *E. erana* is very near to *E. decorata*, Butler, but the much less extent of the bronzy-greenish (in some specimens purplish) coloration, and the greater width and purer whiteness of the inner macular band of the hindwing on the upperside will at once distinguish the males of the two species. Together with *E. decorata* it is found in both large and small forests, and at no very great elevation. Neither species is rare.

233. *EUTHALIA (*Nora ?*) LAVERNA, Butler.

Hagen. Grose Smith. The male is figured in colours by Mr. Distant from Malacca, the female in black and white from Penang. We have been unable to recognise it from Sumatra. Distant's figure of the male has much more the appearance of a female than of the opposite sex. The Bornean form I have named *E.* (*Nora*) *lavernalis*.

234. PYRAMEIS CARDUI, Linnæus.

Snellen. Hagen. Grose Smith. Semper. This cosmopolitan butterfly occurs only on the grassy plains of the Central Plateau, often in large numbers. Dr. Martin only once met with a specimen in the plains near Toentoengan in June, 1888, where it might have been carried by one of the sudden storms known locally as "Sumatrans." The late Herr Honrath, to whom Dr. Martin sent specimens of this species in a letter, at a meeting of the Berlin Entomological Society drew attention to the conspicuously small size, the much darker than normal coloration of the upperside of the hindwing, and the unusually large white triangular spot present on the underside of the hindwing of the Sumatran form.

235. *PYRAMEIS SAMANI, Hagen.

P. samani, Hagen, Iris, vol. vii, p. 359 (1894).

Dr. Hagen described this species from a single torn example obtained in the Karo hills. It is near to *P. dejeanii*, Godart, from Java. Dr. Martin has seen the specimen, which seems to represent a very good though rare species, as his Battak collectors never succeeded in capturing it. It will probably be found more plentifully when the mountains of the Gayoe- and Allas-lands are explored.

236. VANESSA BATTAKANA, de Nicéville, n. sp.

HABITAT: N.-E. Sumatra.

EXPANSE: ♂, 2·5; ♀, 2·6 inches.

DESCRIPTION: MALE and FEMALE. Nearest to *V. perakana*, Distant, from the Malay Peninsula, from which it may be known by the discal blue band on the UPPERSIDE of the *hindwing* being much broader, invading the discoidal cell; in the type of *V. perakana*, now before me, which is a female, it is much narrower, not nearly extending to the cell. The Javan agrees with the Perak species in this feature.

Occurs on the Central Plateau and the high mountains which surround it in May and December, but is very rare, as Dr. Martin has not obtained more than eight or ten specimens during his residence in Sumatra. Dr. Hagen has recently caught it in Sonth Sumatra on Mount Kaba, 5,200 feet, a volcano near Mount Dempo, which is also a volcano.

237. SYMBRENTHIA HIPPOCLUS, Cramer.

Hagen as *hyppoclus* [sic]. Staudinger as *hyppoclus* [sic].

238. SYMBRENTHIA COTANDA, Moore.

Hagen as *hypselis*, Godardt [sic]. Staudinger as *hypselis*. I consider that the true *S. hypselis*, Godart, is confined to Java; the Indian, Burmese, Malayan Peninsula and Sumatran form being *S. cotanda*, Moore = *S. sinis*, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. vi, p. 357, n. 10, pl. F, fig. 9, *male* (1891).

239. SYMBRENTHIA HYPATIA, Wallace.

S. hypatia, Fruhstorfer, Stet. Ent Zeit., vol. lv, p. 125, pl. iii, fig. 4, *male* (1894).

Hagen. Distant has figured this species from Perak, and Fruhstorfer from W. Java, both from males, but neither figure is good. The three Sumatran species of *Symbrenthia* are fairly common on suitable spots, and are thus distributed:—*S. hippoclus*, Cramer, occurs nearest to the sea, but extends over the whole of our area up to the Central Plateau. *S. cotanda*, Moore, first appears south of Namoe Oekor, Dr. Martin took his first specimen near Kampong Singhapura. *S. hypatia* is first met with at the elevation of Bekantschan; both the last-named species extend to the Central Plateau. They like low and small forest, or open places in large forest, and settle on roads and also on the leaves of shrubs and low-growing plants with open wings. Dr. Martin has bred *S. hippoclus* on the Rameh plant (*Urticaceæ*); the larvæ live socially, five or six together, in a single leaf with its edges joined by silk strands so as to make a shelter. The pupæ are somewhat similar to those of *Vanessa urticæ*, Linnæus, the "Small Tortoishell Butterfly" of Europe, and like the species of *Vanessa* and *Pyrameis* the newly-emerged butterfly emits a pigmented fluid of a red colour. The larvæ are common in November and December, the butterflies are very plentiful during the first months of the year, but all the remaining months of the year they are only seen sporadically and rarely. It appears possible that *S. hippoclus* is single-brooded, and that some surviving examples live throughout the year and propagate the species the next season. The second (white) form of female which occurs in Java is not found in Sumatra. All the species of *Symbrenthia* are on the upperside of the wings very similar to the small yellow species of *Neptis*, which they may perhaps mimic when at rest, but their flight is totally different, being excessively rapid, so that it is almost impossible to follow them with the eye.

240. RHINOPALPA POLYNICE, Cramer.

Hagen. Semper as *polinice* [sic]. Kirby. Staudinger. This species was described and figured by Cramer from a male from the west coast of Sumatra. *R. fulva*, Felder, described from Malacca, is an absolute synonym, specimens from Assam, Burma, and the Malay Peninsula being indistinguishable from Sumatran ones. The Javan species, *R. elpinice*, Felder, is quite distinct. *R. polynice* is found only in large forest, and occurs all over our area except in the higher mountains and on the Central Plateau. The males are fond of fæces on forest roads; the females are very rare and seldom seen in collections. Perhaps they escape capture by their coloration being very different from that of the males, as on the wing the female closely resembles a common *Cirrhochroa*.

241. CYRESTIS NIVALIS, Felder.

C. nivea, Zinken-Sommer, var. *interrupta*, Snellen, Tijd. voor Ent., vol. xxxiii, p. 217 (1890).

Grose Smith as *nivea*. Snellen as *recaranus*, Westwood (= *nivea*, Zinken-Sommer, *teste* Snellen), and as *nivea*, var. *interrupta*. Hagen as *nivea*. Staudinger as *nivea* var. *nivalis*, and *nivalis*. *C. nivalis* is a good species, and is found commonly in Burma, the Malay Peninsula, Sumatra and Borneo, and differs from *C. nivea*, Zinken-Sommer, from

Java "In not having a continuous fuscous [costal] margin to the forewing on the upperside, and in the greater amount of ochraceous coloration near the anal angle of the hindwing on the upperside." (*Distant*). Found in Sumatra from near the sea to Soengei Batoe on forest roads, where it settles with wide-spread wings on moist places and by the side of small pools; if pursued it settles on the underside of leaves by the roadside. On the wing when flying rapidly along a forest road in search of moisture it may easily be taken for a pierine butterfly. All the butterflies of this genus in India are well named "The Map" from their characteristic markings and coloration.

242. CYRESTIS IRMÆ, Forbes.

C. irmæ, Forbes, A Naturalist's Wanderings, p. 274 (1885).

C. mænalis, var. *sumatrensis*, Staudinger, Ex. Schmett., p. 133 (1886).

Forbes. Staudinger as *mænalis*, var. *sumatrensis*. Semper as *mænalis*. I have redescribed this species in Journ. Bomb. Nat. Hist. Soc., vol. vi, p. 358, n. 11 (1891). It occurs in the hills of Perak in the Malay Peninsula at 3–4,000 feet elevation. *C. mænalis*, Erichson, is a distinct species, and is found in the Philippine Isles. From the point where *C. nivalis*, Felder, no longer occurs, at Soengei Batoe and on the higher mountains and the Central Plateau, this beautiful and very distinct species is found commonly throughout the year. It is somewhat smaller than *C. nivalis*. The Battak collectors report that it comes down to the small hill streams in crowds with numerous *Pierinæ* to suck up the moisture.

243. CYRESTIS PERIANDER, Fabricius.

Grose Smith. Staudinger. This beautiful species occurs only on the western boundary of our area at higher elevations. Herr M. Ude, the European collector of Dr. H. Dohrn, took some thirty specimens near Bohorok in May, 1894. Dr. Martin obtained his first specimens from Kepras in January, 1895, and also a single example, perhaps a straggler to the south-east, from the Karo mountains in December, 1894. Dr. Martin has caught it himself on the Penang Hill, or "The Crag."

244. CYRESTIS THERESÆ, de Nicéville.

C. theresæ, de Nicéville, Journ. A. S. B., vol. lxiii, pt. 2, p. 18, n. 14, pl. v, fig. 8, *male* (1894).

Dr. Martin obtained a single specimen in May, 1893, from the forest near Selesseh, caught by a very clever and intelligent Chinese collector. Mr. de Nicéville recognised it at once as a species new to science, and at Dr. Martin's request named it in honour of H. R. H. Princess Therese of Bavaria, who is well-known by her valuable works as a scientific traveller. As Dr. Martin almost simultaneously received a large consignment of butterflies from S.-E. Borneo (Bandjermasin), and amongst them a considerable number of this species, we were surprised to find that it had not already been described from that island. It is probable that it previously stood in collections as the really very distinct *C. lutea*, Zinken-Sommer. The late Professor Westwood appears to have been of opinion that the yellow male of *C. lutea* has a *white* female. I have never seen a female of that species, though the male is excessively common. Even Dr. Staudinger has no female in his unrivalled collection so he writes to me. *C. theresæ* stands in his collection under the MS. name of *C. thyonneoides*, from Borneo.

245. CYRESTIS (*Chersonesia*) RAHRIA, Moore.

Hagen as *rahria*, Westwood [sic]. Staudinger as *rahria*, Westwood [sic]. A common species in Burma, the Malay Peninsula, Nias, Sumatra, Java, and Borneo. The name *rahria* is a MS. one of Westwood's; as Moore figured it (though he did not describe it), the species is properly Moore's.

246. CYRESTIS (*Chersonesia*) INTERMEDIA, Martin.

C. intermedia, Martin, Einige neue Tagschmetterlinge von Nordost-Sumatra, pt. 2, p. 4, n. 5 (1895).

247. CYRESTIS (*Chersonesia*) PERAKA, Distant.

Always a rare species, I possess specimens from the Daunat Range, Tenasserim, Burma; Perak in the Malay Peninsula; and Bekantschan and the Battak mountains of Sumatra taken in July and October. Dr. Martin has specimens from Java.

248. CYRESTIS (*Chersonesia*) NICEVILLEI, Martin.

C. nicévillei, Martin, Einige neue Tagschmetterlinge von Nordost-Sumatra, pt. 2, p. 4, n. 6 (1895).

Rare, occurs only in the Battak mountains in May and July. It is a very distinct species, the coloration of the upperside is of a very rich and deep orange, and the fourth pair of black lines counting from the base of the wing on the upperside of the forewing is twice broken, a unique character in the subgenus.

249. CYRESTIS (*Chersonesia*) CYANEE, de Nicéville.

C. (*Chersonesia*) *cyanee*, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. viii, p. 49, n. 8, pl. L, figs. 6, *male*; 7, *female* (1893).

A local race of *C. risa*, Doubleday and Hewitson, found from

Kumaon to Assam and in Burma, also recorded from Java. Dr. Martin in "Einige neue Tagschmetterlinge von Nordost-Sumatra," pt. 2, p. 7, (1895), records *C. cyanee* from Burma, but probably in error, as far as I know it is confined to N.-E. Sumatra. All the species of *Chersonesia* in Sumatra occur only in forests, and unlike true *Cyrestes* never go to roads or moist places, but keep to low bushes and rest on the underside of the leaves. They fly weakly and are easily captured. Nearest to the sea, plentiful near Laboean, appears *C. rahria*, Moore. Higher up, from Namoe Oekor to Bekantschan, occurs the small *C. peraka*, Distant. From Bekantschan to the Central Plateau fly *C. cyanee* and *C. nicévillei*, Martin. *C. intermedia*, Martin, is confined to the North-Western limits of our area, as all the specimens were obtained from the Gayoe collectors. *C. rahria* and *C. cyanee* are the common species, *C. peraka* and *C. intermedia* are very rare, and the most beautiful and distinct *C. nicévillei* is the rarest of all.

250. KALLIMA BUXTONI, Moore.

Snellen as *paralecta*. Hagen as *paralecta*. Both sexes of this species were originally described from Sumatra; it occurs also in the Malay Peninsula at Perak and Sungei Ujong, and again in Borneo. The apex of the forewing in the female is not produced into a long point in this species as it is in many others. I was incorrect in stating in the Gazetteer of Sikhim, p. 146, n. 226 (1894) that the Sumatran *Kallima* like the Javan *K. paralecta*, Horsfield, has a yellow-banded male and a bluish-white-banded female, both sexes being alike in this particular. When writing the paragraph in question, I had yellow males and bluish-white females only from Sumatra, so came to the perhaps natural conclusion that the phenomenon which is unique in the Javan occurs also in the Sumatran species. Since then I have obtained both sexes of both the Sumatran species of *Kallima*, and find that the opposite sexes of each are alike. *K. buxtoni* is always a rare insect in Deli, occurring from Selesseh to Bekantschan. It is very fond of imbibing the sap from wounded trees. The Malay and Javan collectors call it "Koepoe Bandera, the Flag Butterfly," as its red and blue colours resemble the same colours in the Dutch tricolour.

251. KALLIMA SPIRIDIVA, Grose Smith.

K. spiridiva, Grose Smith, A Naturalist's Wanderings, p. 274 (1885); *K. spiridion*, Grose Smith and Kirby, Rhop. Ex., pl. *Kallima* i, figs. 1, 2, *male* (1892).

Grose Smith. FEMALE differs from the male only in the hindwing on the upperside being paler, more brown; and in the forewing having the apex produced into a somewhat short point, half the length of that found in the female of *K. knyvettii*, de Nicéville, from Bhutan, which is a closely allied species. Occurs at higher elevations than *K. buxtoni*, Moore, from Bekantschan to the mountains which surround the Central Plateau in April and July; is also rarer than the yellow species. Both are found only in large forest.

252. DOLESCHALLIA PRATIPA, Felder.

Snellen as *bisaltide*. Hagen as *bisaltide* and *pratipa*. Distant doubtfully from Sumatra as *bisaltide*. The Sumatran form agrees exactly with the one from the Malay Peninsula which has been described by Felder as *D. pratipa*. Whether it should be known by the older names of *D. bisaltide* or *D. polibete*, both of Cramer, I am not prepared to say, as several of the species of this genus are so variable that to define their limits seems the more difficult the greater number of specimens one obtains, more especially as the variations do not appear to be confined to geographical areas. The female of the Sumatran form agrees very fairly with Cramer's figures C and D of pl. cii of Pap. Ex., which also appears to have been taken from a female, and is named "*Papilio*" *bisaltide* from "Surinam," a probable *lapsus calami* for Sumatra. But I have no specimen agreeing exactly with that figure. The Himalayan, Assamese, Burman, South Indian, Ceylonese, Andamanese and Nicobarese form is fairly constant, and is usually identified as *D. polibete*, originally described from Amboina. Hagen records two species of the genus from Sumatra, but this is almost certainly incorrect. *D. pratipa* in Sumatra flies from near the sea to the elevation of Bekantschan, but not higher, and is found in forests and also near houses which are surrounded by fruit trees and small jungle. The females are much rarer than the males. The latter are especially partial to settling on old wood, and are commonly found resting on or flying round wooden bridges on forest roads. Dr. Martin has frequently noticed them resting on wooden bullock carts left on jungle roads, to which they return again and again if disturbed. Dr. Hagen bred it at Laboean, the larva feeding on the Jack-tree (*Artocarpus integrifolia*, Linnæus).

253. CHARAXES (*Eulepis*) DELPHIS, Doubleday.

Hagen. Kirby as *concha*. The *C. concha* of Vollenhoven was described from Padang, Sumatra, and is a synonym of this species. Next to *C. kadenii*, Felder, this is the most beautiful species of *Charaxes* found in Sumatra. It occurs from near the sea to the elevation of Bekantschan, but not higher. Though it is met with everywhere over a large area it is never as plentiful as are *C. dolon*, Westwood, and *C. eudamippus*, Doubleday, in Sikhim in the beds of streams in the spring. As the

Gayoe collectors brought this species in some numbers, it may perhaps be less rare in the north of Sumatra. No female has been obtained. The male is fond of fæces on forest roads; also small pools and moist places on roads, especially if there are any *Pierinæ* assembled to suck up the moisture, with whom the big *Charaxes* always associates. In such spots will be found sitting in the hottest sun perhaps half a hundred or more *Catopsilias* and *Appias hippo*, Cramer, and amongst them one *Charaxes delphis*, numbers of similarly-coloured butterflies evidently affording mutual protection. Dr. Martin's Javan collector Saki in consequence of this characteristic used to call *C. delphis* the "Koepoe Raja," because it sat amongst the *Pierinæ* like a Raja surrounded by his followers. *C. delphis* is not restricted only to big jungle, but is found on roads far from the forest, if only there are assembled the protecting *Pierinæ*. Dr. Martin notes that in 1886 he gave up collecting for some time, till in August, 1887, when on his way to pay a medical visit at the Kloempang Estate, he saw at five o'clock in the evening a fine specimen of *C. delphis*, which was seeking a comfortable night's lodging under the roof of a tobacco shed. As Dr. Martin was on horseback he could not catch the butterfly, but on shewing it to a passing Chinese coolie this man was so clever as to kill it without any damage by throwing a piece of wood at it. Dr. Martin took it home in his note book, and from that day commenced a new collection on pins, which is now in the Royal Museum at Munich, and of course includes this specimen which instigated his commencing to re-collect, and to which may also be due the production of this paper.

254. *CHARAXES (*Eulepis*) SCHREIBERI, Godart.

Dr. Hagen informed Dr. Martin that he obtained this rare species from his Gayoe collectors. It would appear that the north-western boundary of our area is the head-quarters of the genus in Sumatra, as the Gayoes always brought in three or four times as many specimens of *Charaxes* as the Battaks did. *C. schreiberi* probably does occur in Sumatra, as it is certainly found in the Malay Peninsula, Java and Borneo. It is singular, however, that Dr. Hagen should have omitted it from both his papers. Dr. Martin picked up from the ground two forewings without body of this species in Fort Canning in the middle of Singapore. It is most remarkable how frequently the only record we have of this species is from single wings picked up in a similar way. It would seem to be that *C. schreiberi* is greatly persecuted by birds.

255. CHARAXES (*Eulepis*) KADENII, Felder.

Dr. Wallace obtained the first known specimen of *C. kadenii* in

Western Java at a high elevation in 1861, and very appropriately called it "The Calliper Butterfly," since when only very few specimens have reached Europe. In 1889 Dr. Martin found only one old and worn specimen in all the larger German collections when visited by him, which specimen is now in the Berlin Museum. The first in Sumatra was obtained from the Central Plateau in 1892, where alone it is found, and although Dr. Martin offered a special bonus of a dollar for every further specimen, only seven in all were brought in. Nearly all were captured on the fæces of Karbouw buffaloes, deposited on the sandy river banks where the buffaloes used to drink. Herr H. Fruhstorfer was sent to Java by the late Herr Honrath to collect *Rhopalocera*, but with special instructions to look out for *C. kadenii*, but he was not successful in getting it. Since then a retired non-commissioned officer of the Dutch Indian Army settled in Java, Heer C. E. Prillwitz, has captured eight specimens in Preanger.

256. CHARAXES (*Eulepis*) ATHAMAS, Drury.

Snellen. Hagen as *athamas* and *samatha*. Mr. Moore described *C. samatha* from Tenasserim, and afterwards recorded and figured it from Ceylon. It is a synonym of *C. athamas*, which latter is without doubt the commonest of all the *Charaxes* in Deli, occurring from near the sea to Bekantschan and Soengei Batoe; females are very rare. The males are very fond of moist places and fæces, to which they will always return after being disturbed; when frightened they retire temporarily to the leaves of the higher trees well out of reach, and settle with folded wings. On the wing they are not easily differentiated from the *Pierinæ*, only their flight is very much stronger and more rapid.

257. CHARAXES (*Eulepis*) HEBE, Butler.

Grose Smith. Butler. Staudinger. Kirby. Distant. Originally described from Sumatra.

258. CHARAXES (*Eulepis*) MOORI, Distant.

Hagen.

259. CHARAXES (*Eulepis*) JALYSUS, Felder.

We have here to do with three very difficult species, or perhaps we may say two, as *C. jalysus* appears to be fairly constant, though I am not at all sure that it will not hereafter be found to gradually merge into the two previously-named species. *C. jalysus* has the greenish-white areas of both wings on both sides the largest of the three. *C. moori* appears to be best distinguished from *C. hebe* by having the inner edge of the broad outer black margin to the forewing on the upperside straight and even, ending sharply on the inner margin of the wing at some distance from the inner angle, in *C. hebe* the inner edge of the band is much waved, it does not end sharply on the inner margin, and it often ends at the anal angle instead of extending along the inner margin for some distance as it always does in *C. moori.* The width of the outer black border to the hindwing on the upperside is very variable, but it appears to be usually broader and better defined in *C. moori* than in *C. hebe*, in which latter species it is sometimes reduced to a double series of black spots (as in Butler's figure) being the remnants of incomplete ocelli. The width and extent of the greenish-white areas on the underside are excessively variable in the two species, and as far as I can judge from my large series of specimens from the Malay Peninsula, Sumatra, Java, and Borneo, present no specific characters. Herr Röber in Ent. Nach., vol. xx, p. 290, and vol. xxi, p. 63 (1894-95), has been at the pains to define the *athamas*, *hebe*, and *jalysus* groups of *Charaxes*, and describes many new species, with which we have to deal with *C. heracles*, Röber, from Borneo (in his first paper), and from Borneo and Deli in Sumatra (in his second paper), supposed to be a local race of *C. moori*; and *C. albanus*, Röber, from Deli, Sumatra, supposed to be a local race of *C. hebe.* These two species have been described from most inadequate material, and are in my opinion absolute synonyms of *C. moori* and *C. hebe* respectively. Considering the many bad species that have been created in the *C. athamas* group, it is extraordinary that Herr Röber should have evolved a similar chaos in the *C. hebe* group. In the *C. athamas* group he describes from single female examples *C. fruhstorferi* from South Java, and *C. phrixus*, also from Java, while admitting that he has never seen the female of the most common of all the species of the group, *C. athamas*, Drury. In his first paper he puts *C. hebe* and *C. moori* in one group, in his second paper he makes two groups of them. In his first paper he gives *C. hebe* from Sumatra, in his second he gives the Sumatran form of *C. hebe* a new specific name, though the species was originally described from Sumatra, and names the Javan form of *C. hebe*—*C. javanus.* Mr. Fruhstorfer in Ent. Nach., vol. xxi, p. 197 (1895) has described still another *Charaxes* from North Borneo of the *moori* group, which he has named *C. sandakanus.*

The three foregoing species are all much rarer than *C. athamas*, but are quite similar in their habits. *C. hebe* and *C. moori* occur at lower elevations in the Battak mountains from Selesseh to Bekantschan, whereas *C. jalysus* was mostly captured by the Gayoe collectors in the forests west of Langkat leading to their country. We have seen no females of either of these species.

260. CHARAXES ECHO, Butler.

Originally described from Singapore, recorded from Borneo by Druce. It is one of the rarest insects in our area, as two specimens only have been captured, both in high forest near Selesseh. It is smaller and darker than the allied *C. fabius*, Fabricius, of India and Burma.

261. CHARAXES (*Haridra*) BORNEENSIS, Butler.

Grose Smith. Distant. Like *C. delphis*, Doubleday, and *C. jalysus*, Felder, except a few specimens from the Battak mountains, has only been captured in the forests west and north of Selesseh, by the Gayoes while collecting gutta percha. Dr. Martin possesses one specimen taken in Asahan in 1891. We have not seen its female.

262. CHARAXES (*Haridra*) DURNFORDI, Distant.

This species was originally described from Sungei Ujong in the Malay Peninsula from a single male. An allied species is *C. nicholii*, Grose Smith, described from Burma, and figured in Rhopalocera Exotica, vol. i, pl. *Charaxes* ii, figs. 1, 2, *male* (1887). I possess a single specimen of this very rare species caught by Colonel C. T. Bingham in October, in the bed of the Kaukareit stream at the foot of the Daunat Range, Tenasserim, which differs from the figure of *C. nicholii* in its larger size, the ocelli on the upperside of the hindwing larger, within which from the costal nervure to the first median nervule is a waved black line, anteriorly prominent, posteriorly becoming obsolete. *C. durnfordi* is very rare in Sumatra, rarer even than *C. kadenii*, Felder, as Dr. Martin obtained only five specimens. Occurs in heavy forest on the lower ranges and outer spurs of the Battak mountains, where Dr. Martin in 1888 captured his first male specimen at Roemah Kenangkong, now in the royal collection at Munich. Dr. Hagen took a male in 1891, at Bandar Quala in Serdang. In 1892 Dr. Martin received a female from a Battak collector, which is larger and duller coloured than the male, the whitish-violet markings on the upperside of the hindwing of greater extent, and the tails longer.

263. CHARAXES (*Haridra*) HARPAX, Felder.

Hagen. Snellen as *polyxena*. Moore. It was originally described without habitat; and has been recorded from Lower Burma, the Malay Peninsula, Sumatra, and Borneo. *C. polyxena*, Cramer, was described from a male from China, and is the oldest name of all the tawny group of *Charaxes*. *C. harpax* is found in Sumatra from the sea (Paya Bakong) to Bekantschan. It occurs in every forest, where it is especially partial to fæces and moist spots. It is a very variable insect as regards the extent of the black coloration on the upperside of the forewing, and the colouring of both wings on the underside. Some of our specimens agree very well with Mr. Moore's figures of *C. corax*, Felder, in Lep. Ind., vol. ii, pl. clxxv (1895). This species is restricted by Mr. Moore to Sikhim, Bhutan, Assam and Burma. Other specimens agree very closely with the figures of *C. hierax*, Felder, given on the next plate of Mr. Moore's work above mentioned, and recorded by him from Assam only. Of the three names, *harpax*, *corax*, and *hierax*, the last is the oldest. It is more than probable, however, that the species will hereafter stand as *C. baya*, Moore, originally described from Java, which is still older, and with the description of which (it has never been figured) some of our specimens agree very closely. The females are very rare; Dr. Martin possesses two only. The tails are much longer than in the male, and somewhat spoon-shaped, one specimen in Dr. Martin's collection has two tails, one each at the terminations of the first and third median nervules.

264. CHARAXES (*Haridra*) ARISTOGITON, Felder.

Originally described without locality, but found in the eastern Himalayas, Assam, Burma, the Malay Peninsula, and Sumatra. Our specimens agree better with Mr. Moore's figures of *C. desa*, Moore, Lep. Ind., pl. clxxii, from Lower Burma, but I am not prepared to admit that species to be distinct from *C. aristogiton*. Occurs only at the higher elevations, from Bekantschan to the Central Plateau, is not very common, and is not at all variable as is *C. harpax*, Felder. The underside of both wings is of a richer and darker red than in specimens from Sikhim. No female has been obtained.

265. CHARAXES (*Haridra*) DISTANTI, Honrath.

Originally described from Perak and Sarawak (Borneo). It is perhaps a local race of *C. marmax*, Westwood, from the eastern Himalayas, Assam and Burma, but may be instantly known from it by the basal half of the costa of the forewing on the underside being pure snow-white instead of concolorous with the rest of the wing. Occurs in Middle Tenasserim of Lower Burma, and in Sumatra in the forests of the plains, at Paya Bakong and at Selesseh, perhaps not higher than Namoe Oekor. It is a rare species, and we have not seen its female.

266. PROTHOE CALYDONIA, Hewitson.

Originally described from Malacca. Two local races of this splendid butterfly have recently been defined, *P. belisama*, Crowley, from Tonghou, Central Burma, and *P. chrysodonia*, Staudinger, from Davao, S.-E. Mindanao, in the Philippine Isles. In Sumatra *P. calydonia* is found only in forest from Selesseh to Bekantschan and higher, and is rare as it always is everywhere. Dr. Martin took his first specimen, the first known from Sumatra, in October, 1888, near Kampong Roemah Kenangkong on a wounded tree where it was sucking up the juice. Since then he has obtained eight other specimens. As above mentioned (p. 420, n. 202), there may be found over a large area of forest only one pair of this strong-winged butterfly, which likes to keep to the higher trees, quite out of the reach of the net, but is fond of fæces and strong smelling things such as carrion, to which it is often attracted and caught. From Wallace's account of the capture of the type specimen of the species at Ayer-panas in Malacca it is known how closely this insect keeps to one place, even to the same tree. It was on the fourth day, after having missed it the three previous days, and on the very same tree, that Dr. Friedl Martin caught his first specimen at Aer Kesoengei in Asahan. *P. calydonia* settles with the head downwards on tree trunks, and makes while feeding the same rotating movements of the hindwings as is done by many *Lycænidæ*.

267. PROTHOE ANGELICA, Butler.

Grose Smith as *franckii*. Hagen as *frankii* [sic], Godardt [sic]. Wallace as *franckii*. Distant. Semper. The true *P. franckii*, Godart, is confined to Java. Occurs in Sumatra in the same localities and elevations as *P. calydonia*, Hewitson, but is not so rare; settles also on tree trunks with its head downwards.

Family LEMONIIDÆ.

Subfamily LIBYTHÆINÆ.

268. LIBYTHEA MYRRHA, Godart.

Hagen as *myrrha*, Godardt [sic]. Found in forest from Selesseh to Soengei Batoe, and is not very common. It is fond of settling with folded wings on wet sand on the banks of small streams.

269. LIBYTHEA NARINA, Godart.

The *L. rohini* of Marshall is a synonym of this species. Occurs in Sumatra near to the sea, as Dr. Martin obtained his first specimen near Kamborg-house between the Saentis and Mabar Estates in May, 1890. Found also at Selesseh, but does not extend higher than Namoe Oekor, and is very rare.

Subfamily NEMEOBIINÆ.

270. ZEMEROS ALBIPUNCTATA, Butler.

Hagen as *flegyas*. Staudinger. Distant.

271. ZEMEROS EMESOIDES, Felder.

Hewitson. Grose Smith as *Temeros* [sic] *emesoides*. Both species of *Zemeros* are found chiefly in forests on the flowers or red fruits of some shrub of medium height, on which they feed. They rest with half open wings. Both species are very delicate, and it is almost impossible to obtain a perfect example of either for the cabinet. *Z. albipunctata*, Butler, is much the commoner, and is spread over the whole of our area; whereas *Z. emesoides* is much rarer, does not occur near the sea, and is found from Selesseh to Bekantschan.

272. STIBOGES NYMPHIDIA, Butler.

Hagen. Found only on the Central Plateau, and is rare even there, as in all Dr. Martin has only obtained six specimens in thirteen years.

273. TAXILA THUISTO, Hewitson.

Hewitson. Hagen. Grose Smith. Distant. Rare in Deli, occurs in forests only from Selesseh to Bekantschan.

274. TAXILA HAQUINUS, Fabricius.

Hagen. Staudinger. Hewitson as *drupadi*. The "*Emesis*" *drupadi* of Horsfield, described from Java, is a synonym of this species. Very common in the forests of the plains, abounded in April and May, 1894, near Selesseh. Both the species of *Taxila* are fond of the same shrub frequented by the two species of *Zemeros*.

275. LAXITA DAMAJANTI, Felder.

Snellen. Staudinger as *tanita*. For remarks on *L. tanita*, Hewitson, see de Nicéville, Journ. A. S. B., vol. lxiii, pt. 2, p. 22 (1894). It appears that Staudinger's *tanita* = *damajanti*.

276. LAXITA LYCLENE, de Nicéville.

L. lyclene, de Nicéville, Journ. A. S. B., vol. lxiii, pt. 2, p. 21, n. 17, pl. ii, fig. 10, *male* (1894).

Hewitson as *telesia*. Hagen as *telesia*. Grose Smith as *telesia*. Staudinger as *telesia*. Kirby as *telesia*. Distant as *telesia*. This is a local race of *T. telesia*, Hewitson, from Borneo.

277. LAXITA ORPHNA, Boisduval.

Hewitson. Grose Smith. All the species of *Laxita* are of weak flight, and found in forests only. Owing to their very delicate structure and colours, perfect specimens are very scarce. *L. lyclene*, de Nicéville, is the commonest, and occurs in the plains, very plentiful near Selesseh together with *T. haquinus*, Fabricius. *L. damajanti*, Felder, is less common from Namoe Oekor to Bekantschan. *L. orphna* is decidedly rare, and is found from Bekantschan to the Central Plateau.

278. ABISARA SAVITRI, Felder.

Hewitson as *susa* and *savitri*. Hagen. Grose Smith as *susa*. Staudinger. The "*Sospita*" *susa* of Hewitson is a synonym of this species, and is so given by Hewitson himself.

279. ABISARA AITA, de Nicéville.

A. aïta, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. viii, p. 49, n. 9, pl. L, fig. 10, *male* (1893).

HABITAT: N.-E. Sumatra.

EXPANSE: ♀, 2·15 inches.

DESCRIPTION: FEMALE, differs from the male in being slightly larger, the ground-colour of the UPPERSIDE of *both wings* is dull ferruginous instead of dull hair-brown, the two discal bands of the *forewing* are wider and more prominent, and the white area of the *hindwing* is rather larger. UNDERSIDE shews the same differences as are found on the upperside.

The two species of *Abisara* with tails are rare, and are somewhat stronger on the wing than the other species of the subfamily. *A. savitri*, Felder, belongs to the forests of the alluvial plain, whereas *A. aïta* is only found at high elevations, from Soengei Batoe to the Central Plateau. Dr. Martin first received the latter from his Battak collectors in July, 1893.

280. ABISARA KAUSAMBI, Felder.

Hewitson. Hagen as *echerius*, var. *kausambi*. Butler as *Albisara* [sic] *kausambi*. Distant. A distinct species, the male of which has two pale bands crossing the disc of the forewing on the upperside, the outer of which is anteriorly developed into a somewhat broad whitish fascia. The hindwing on the upperside shews two apical and two anal black spots. It was originally described from the Malay Peninsula; I possess specimens from Perak, Jelebu and Singapore, also in the Malay Peninsula, and from Sumatra and Borneo.

281. ABISARA KAUSAMBIOIDES, de Nicéville, n. sp.

A. kausambi, Distant (*nec* Felder), Rhop. Malay., p. 189, n. 2, pl. xviii, fig. 10, *male* (1883).

HABITAT: Penang and Perak in the Malay Peninsula, N.-E. Sumatra, Nias.

EXPANSE: ♂, 1·8 to 1·9 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* rich dark prune-coloured, beautifully glossed with dark purple in some lights, much more so than in either sex of *A. kausambi*, Felder; without markings. UNDERSIDE, *both wings* of the same rich prune-colour as on the upperside, but without purple reflections. *Forewing* with the usual pair of discal parallel narrow pale purplish lines, which widen out somewhat on nearing the costa; a narrow submarginal whitish line from the anal angle, becoming obsolete beyond the middle of the wing. *Hindwing* with the usual pale discal band, three apical and two anal black spots each bearing outwardly a fine white line, between these spots in the median interspaces are a pair of pale lunules, a submarginal narrow dark line, inwardly defined with a very fine white line.

I have described this species as new with some reluctance, as the butterflies of this group of the genus *Abisara* are obviously very variable, these variations being apparently not confined in some cases to geographical areas, so that the numerous names which have already been given to many of these varietal forms are by no means easy to allocate. There are, however, obviously two species of *Abisara* of this group occurring in the Malay Peninsula and N.-E. Sumatra, the males of both being easily separable. *A. kausambi*, Felder, is much ornamented with whitish bands and black spots on the upperside, while *A. kausambioides* is entirely plain and unmarked; the ground-colour of the latter is also much deeper. The females of the two species I am unable to differentiate. Mr. Distant's figure and description of the male quoted above evidently applies to the present species, and do not at all agree with Felder's description of the male of *A. kausambi.*[*] *A. kausambioides* is perhaps nearest to *A. prunosa*, Moore, from Ceylon, but that species has the male normally ornamented with pale bands and black spots on the upperside. The two non-tailed *Abisaras* are not uncommon in N.-E. Sumatra, *A. kausambi* occurring near the sea (Loboe Dalam) to Namoe Oekor, while *A. kausambioides* is found from Namoe Oekor to Bekantschan. Both are of very delicate structure, and quickly get rubbed and worn. All the butterflies of the subfamily keep close to the ground, and rest with half-opened wings.

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[*] See the last paragraph on p. 324 of Butt. of India, vol. ii. When writing this I possessed but two male *Abisaras* of this group from the Malay Peninsula, one each represents *A. kausambi* and *A. kausambioides*: from this small material I did not dare to describe a new species.

Family LYCÆNIDÆ.

282. GERYDUS GIGANTES, de Nicéville.

G. gigantes, de Nicéville, Journ. A. S. B., vol. lxiii, pt. 2, p. 23, n. 19, pl. v, figs. 1, *male*; 13, *female* (1894).

Dr. Martin obtained the type of this species in October, 1892, from the mountains caught by the Battak collector Si-Ketjap, and later on Dr. Martin took several specimens himself at Namoe Oekor in August and November, so this fine and large species probably occurs from the latter place to the Central Plateau. On the wing it greatly resembles some species of *Pierinæ*, and will certainly when flying be always taken by collectors for an insect of that subfamily. It is found also in Penang, and is the largest and most distinct species in the genus. More than half the surface on the upperside in both sexes is pure chalky-white.

283. GERYDUS SYMETHUS, Cramer.

Grose Smith. Hagen. Occurs everywhere from near the sea to the elevation of Namoe Oekor, even near houses, in orchards, and in cocoa-nut plantations. It is common every year at Bindjei in November and December.

284. GERYDUS GALLUS, de Nicéville.

G. gallus, de Nicéville, Journ. A. S. B., vol. lxiii, pt. 2, p. 25, n. 21, pl. v, fig. 11, *female* (1894).

The figure of this species has not been well reproduced, the ochreous and ferruginous mottlings of the underside not being shewn at all. The white band on the upperside of the forewing is also shewn too narrow. It differs from *G. symethus*, Cramer, in many particulars, but chiefly in having no whitish colour within the oblique discal white band on the upperside of the forewing, whereas in *G. symethus* the base of the wing up to the discal band is bluish-grey instead of brown. It is rare near Selesseh, but is more plentiful in the lower hills and outer spurs of the mountains.

285. GERYDUS BIGGSII, Distant.

The *G. gopara*, de Nicéville, is probably the same species. It is nearly as common as *G. symethus*, Cramer, but is found at a higher elevation, from Namoe Oekor to Bekantschan.

286. GERYDUS ZINCKENII, Felder.

I possess one female example from Sumatra which agrees with typical Javan specimens of this species. It may be known by the white area of the forewing on the upperside occupying half the surface, its outer edge straight; in *G. symethus*, Cramer, and *G. gallus*, de Nicéville, the pure white area is much smaller, and is confined to the disc, not reaching the base of the wing, with its outer edge very irregular.

287. GERYDUS GÆTULUS, de Nicéville.

G. gætulus, de Nicéville, Journ. A. S. B., vol. lxiii, pt. 2, p. 24, n. 20, pl. v, fig. 12, *female* (1894).

On the upperside the forewing is precisely similar to that of *G. zinckenii*, Felder, but the hindwing differs in that instead of being dull fuscous throughout, half the surface is white, with a prominent fuscous disco-cellular line. On the underside it hardly differs from *G. biggsii*, Distant. It is rare, I have seen three females only taken in July and October near Bekantschan.

288. GERYDUS BOISDUVALI, Moore.

Very rare, I possess one female only from Sumatra, which is certainly this species.

289. GERYDUS GÆSA, de Nicéville.

G. gæsa, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. x, p. 26, n. 10, pl. S, fig. 16, *male* (1895).

May be known from all the described species in the genus by the upperside being immaculate in both sexes. The underside is very similar to that of *G. biggsii*, Distant. It is found from Bekantschan to the Central Plateau in January, March and July.

290. *GERYDUS ZYMNA, Doubleday and Hewitson.

Grose Smith as *Miletus zymna*. The type of the genus *Miletus* is "*Papilio*" *polycletus*, Linnæus, from the Moluccas. Mr. Druce has monographed the genus in Trans. Ent. Soc. Lond., 1891, p. 179, but unfortunately uses the name *Hypochrysops*, Felder, for it, of which "*Thecla*" *anacletus*, Felder, also from the Moluccas, has been fixed by Mr. Scudder as the type, and which species is congeneric with *Miletus polycletus*. I may note here that a female example of *M. cœlisparsus*, Butler, described from Nias Island, off the west coast of Sumatra, has been obtained on Penang Hill ("The Crag") by Mr. A. R. Adams, and will almost certainly be hereafter obtained in the island of

Sumatra which lies between Nias and Penang. I may remark also that I wrote blindly in Butt. of India, vol. iii, p. 21, when I suggested that the genus *Miletus* belongs to the *Gerydus* group; at the time of writing I had seen no specimen of true *Miletus*. Previous writers had used *Miletus* and *Gerydus* for *symethus*, Cramer, which led me astray. "*Miletus*" *zymna* would appear to be a true *Gerydus*, but as it was described from Ashanti, is not likely to be found also in Sumatra. The nearest Sumatran species to which it is superficially allied is *G. gætulus*, de Nicéville.

291. PARAGERYDUS HORSFIELDI, Moore.

Grose Smith as *horsfeldi* [sic]. Hagen. Very common everywhere over the whole of our area. Very variable in size, some females being much smaller than the average of males. Also variable in the coloration of the underside, some Sumatran specimens approach very closely to *P. taras*, Doherty, from Burma, but none of them have "the apex [of the forewing so] widely tinged with rufous-brown" as in that species.

292. PARAGERYDUS PANORMIS, Elwes.

Allotinus panormis, Elwes, Proc. Zool. Soc. Lond., 1892, p. 619, pl. xliii, figs. 8, *male*; 9, *female*.

Rare, but occurs at Bekantschan in February, August, September and November, so probably generation follows generation at short intervals. May be recognised at once by the apex of both wings on the underside being greatly infuscated. I have placed it in the genus *Paragerydus* rather than *Allotinus*, as it has the upper discoidal nervule of the forewing originating well beyond instead of at the apex of the discoidal cell.

293. PARAGERYDUS PÆTUS, de Nicéville.

P. pætus, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. ix, p. 269, n. 7, pl. O, fig. 12, *male* (1895).

A very distinct species from Bekantschan and at higher elevations. Flies in February, March, and again in November.

294. PARAGERYDUS PORTUNUS, de Nicéville.

P. portunus, de Nicéville, Journ. A. S. B., vol. lxiii, pt. 2, p. 27, pl. v, fig. 14, *male* (1894).

The very dark colour of the underside will suffice to distinguish this species; Sumatran specimens are even darker than typical ones from Java, the ground-colour being pale ferruginous instead of pale ochreous, with dark ferruginous mottlings. Is commoner than the preceding species in May and September in the same localities. All species of *Gerydus* and *Paragerydus* are shade-loving butterflies, and never venture into the direct rays of the sun. With the exception of the three common species, *G. symethus*, Cramer, *G. biggsii*, Distant, and *P. horsfieldi*, Moore, they are only found in deep forest, mostly restlessly flying round the buds of not very high bushes. They are rather weak on the wing, but disappear immediately in the forest if pursued. Both genera can be instantly distinguished by the structure of the legs in both sexes, and both possess three or four minute whitish or ochreous spots on the costa of the forewing on the upperside. These are very prominent in *P. pætus*, de Nicéville, and *P. horsfieldi*, Moore, less so in *P. panormis*, Elwes, and just visible only in *P. portunus*, de Nicéville.

295. ALLOTINUS NIVALIS, Druce.

Occurs throughout the year in forest near Selesseh, but is rather rare.

296. ALLOTINUS ALKAMAH, Distant.

Distant. Found from Namoe Oekor to the Central Plateau, but is always rare. I do not yet possess specimens of *A. subviolaceus*, Felder, from Java, to compare with Burmese, Malayan Peninsula and Sumatran specimens of *A. alkamah*. It is I think probable that the latter is only a synonym of the former.

297. ALLOTINUS APUS, de Nicéville.

A. apus, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. x, p. 27, n. 11, pl. S, fig. 17, *female* (1895).

Two female specimens only have been obtained at Bekantschan in February, 1894.

298. *ALLOTINUS MAJOR, Felder.

Hagen. Originally described from Celebes. We have not seen any species from Sumatra agreeing with Felder's description and figure. It is probable that Dr. Hagen identified *A. apus*, de Nicéville, with this species, as superficially they are somewhat similar.

299. LOGANIA MALAYICA, Distant.

Originally described from Sungei Ujong in the Malay Peninsula.

300. LOGANIA SRIWA, Distant.

Originally described from Malacca in the Malay Peninsula.

301. LOGANIA MARMORATA, Moore.

Originally described from Elphinstone Island in the Mergui Archipelago of Lower Burma.

302. LOGANIA LUCA, de Nicéville.

L. luca, de Nicéville, Journ. A. S. B., vol. lxiii, pt. 2, p. 28, n. 24, pl. ii, fig. 13, *female* (1894).

Found in Burma (Rangoon, the Daunat Range and Ataran Valley in Tenasserim), in the Malay Peninsula (Perak), and in Sumatra. This is the species referred to by Doherty under *Logania massalia* in Journ. A. S. B., vol. lx, pt. 2, p. 37, n. 10 (1891), as being undescribed from Perak. The general colour of the ground on the underside is brownish-ochreous or pale ferruginous. The figure has been badly reproduced, as it shews the apex of the forewing far too acute.

303. LOGANIA MASSALIA, Doherty.

Described from Margherita in Upper Assam. I possess specimens from the Daunat Range in Tenasserim, Burma, from Singapore captured by Dr. Martin, and from Sumatra and Java. The ground-colour of the underside is quite different to that of *L. luca*, de Nicéville, being white speckled with blackish and ochreous, instead of pale ferruginous. The males of both these species have a small round white spot in the middle of the disc of the forewing on the upperside, the hindwing throughout concolorous with the forewing, both being dull purplish-fuscous. A list of the known species of the genus will be found in Journ. A. S. B., vol. lxiii, pt. 2, p. 29 (1894). The *Loganias* are true inhabitants of large forest, and fly like *Gerydus* round the buds of low bushes, but are decidedly quicker on the wing than they. *L. malayica*, Distant, and *L. sriwa*, Distant, occur all the year round in the forests of the plains, and do not go much higher than Namoe Oekor. Both species remind one when flying of a common lycænid, such as *Cyaniris* or *Catochrysops*. *L. marmorata*, Moore, *L. luca*, de Nicéville, and *L. massalia* are found at higher elevations beginning with Namoe Oekor, and occur mostly in the first months of the year, January and February. In 1893 and 1894 Dr. Martin caught a pair of *L. marmorata in coitû* in January in the forest south of Namoe Oekor. The white patch on the upperside of the forewing not reaching the base of the wing will at once separate *L. massalia* from *L. marmorata* and *L. luca*.

304. ZARONA PHARYGOIDES, de Nicéville.

Z. pharygoides, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. v, p. 208, pl. E, fig. 3, *male* (1890).

The type specimen was from Johore in the Malay Peninsula. Dr.

Martin obtained only two males of this rare species at Bekantschan in March and May.

305. Poritia sumatræ, Felder.

Felder. Butler. Grose Smith. Kirby. Distant. Originally described from Sumatra. A very distinct and easily recognised species which shews but little variation. Occurs in the Battak mountains.

306. Poritia erycinoides, Felder.

Grose Smith. Hagen. Felder originally described and figured a male from Java, Hewitson described and figured the female as *P. phraatica* from Singapore, the latter being black on the upperside marked with orange. I have a good series of both sexes from Java, which agree with Sumatran ones from the Battak mountains.

307. Poritia pleurata, Hewitson.

The type of this species was from Singapore. The male may be known from *P. erycinoides*, Felder, by having the apical half of the forewing on the upperside black and unmarked instead of heavily marked with blue. The female of *P. pleurata* is marked with blue in some lights, green in others. Occurs in Sumatra at Bekantschan.

308. Poritia promula, Hewitson.

Originally described from a female from Java. Dr. Martin possesses female specimens which agree very well with Hewitson's figures and description.

309. Poritia philota, Hewitson.

Hewitson. Grose Smith. Kirby. Originally described from Sumatra, where it occurs at Selesseh and in the Battak mountains. It is found also at Pahang and Johore in the Malay Peninsula. The female is unknown. The male is easily distinguished by the very dark colour of the underside, Mr. Hewitson calls it "rufous-brown, undulated throughout with paler colour." I would describe the ground-colour as fuscous, the macular bands very close together, dark ferruginous in colour, outwardly defined with black.

310. Poritia plateni, Staudinger.

P. plateni, Staudinger, Iris, vol. ii, p. 104, pl. i, fig. 8, *male* (1889).

Originally described from two males from Palawan in the Philippine Isles. It is a most distinct species, all the bands of the underside present in every *Poritia* are in this species broken up into well-separated spots. The *Poritias* in the male sex have perhaps on the upperside the most brilliant coloration of all the oriental *Lycænidæ.* They are forest animals, and appear very early in the day as soon as the sun has dried the leaves of the higher bushes or small trees, on which they settle for the sunny tropical forenoon, leaving their favourite perch for a high flight from time to time, but always returning to the same spot. They may be found on the wing before seven o'clock in the morning, but disappear at noon, after which hour they are never seen. In Sumatra *L. erycinoides*, Felder, and *L. pleurata*, Hewitson, are found in the plains, the other species are caught on the outer ranges of the hills from Namoe Oekor to Soengei Batoe. No species is really common, though *P. sumatræ*, Felder, and *P. philota*, Hewitson, are somewhat less rare than the others. They fly all the year round, but are more common from June to August. The females of all the species are very scarce and are seldom seen in collections. A Battak collector in Dr. Martin's service named Similir was particularly clever in getting *Poritias*, and obtained nearly all the specimens in Dr. Martin's collection. He asked for a pair of forceps to reverse without damage the wings of those specimens which died "inside out" as it is often the annoying habit of many small butterflies to do.

311. SIMISKINA PHALENA, Hewitson.

S. phalena, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. ix, p. 270, n. 8, pl. O, fig. 23, *female* (1895).

Originally described from a male from Singapore; it occurs also in the Patkoi Hills of Upper Assam (= *Massaga hartertii*, Doherty), the Katha District of Upper Burma, and in N.-E. Sumatra, taken at Toentoengan in the compound of Dr. Martin's house by Lieut. Ernst Hartert. I have described and figured the female. Dr. Martin obtained a second male specimen in May, 1894, from the Battak mountains.

312. SIMISKINA PHARYGE, Hewitson.

S. pharyge, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. vi, p. 361, n. 12, pl. F, fig. 11, *female* (1891).

Originally described from a male from Borneo, I figured and described the female. It occurs also at Perak and Penang in the Malay Peninsula; at Renong in Western Siam; and Herr M. Ude, Dr. H. Dohrn's collector, obtained a pair at Bohorok in Eastern Sumatra, in September, 1894.

313. SIMISKINA PAVONICA, de Nicéville.

S. pavonica, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. x, p. 28, n. 12, pl. S, fig. 18, *male* (1895).

Near to *S. pediada*, Hewitson, from Mergui in Lower Burma and from Singapore. Found in the Battak mountains of Sumatra very rarely.

314. SIMISKINA PROXIMA, de Nicéville.

S. proxima, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. x, p. 29, n. 13, pl. S, figs. 19, *male*; 20, *female* (1895).

Near to *S. potina*, Hewitson, from Burma and the Malay Peninsula. A single pair of this species is in Dr. Martin's collection, the male obtained by Herr Ude at Bohorok in Eastern Sumatra in September.

315. SIMISKINA PROCOTES, de Nicéville.

S. procotes, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. x, p. 32, n. 14, pl. S, fig. 21, *female* (1895).

Near to *S. potina*, Hewitson, from Burma and the Malay Peninsula. Described from a single female taken in July at Bekantschan. The remarks regarding *Poritia* given above apply equally well to the genus *Simiskina*. With the exception of *S. proxima*, de Nicéville, of which Dr. Martin took a female in April, 1890, very near the sea at the Saentis Estate, all occur in the outer mountains higher than Namoe Oekor. All the species are very rare, but appear to occur more frequently from June to August.

316. PITHECOPS HYLAX, Fabricius.

Snellen as *Plebejus* [sic] *hylax*. Hagen. Staudinger. In large forest, also wherever a small piece of jungle is left in young forest, will *P. hylax* be found flying so quickly that the eye of the collector cannot always follow the little animal. In shadow it is soon lost to view, but becomes visible again when passing one of the errant sunbeams of the forest. It prefers low elevations and occurs throughout the year.

317. PITHECOPS MARIÆ, de Nicéville.

P. mariæ, de Nicéville, Journ. A. S. B., vol. lxiii, pt. 2, p. 30, n. 26, pl. iv, figs. 2, *male*; 9, *female* (1894).

Occurs from Namoe Oekor to the Central Plateau where *P. hylax*, Fabricius, is no longer found. Dr .Martin obtained the types in September, 1893, from Bekantschan. It is nearly allied to, but quite distinct from, *P. fulgens*, Doherty, from Margherita in Upper Assam, the only other species in the genus yet known which has the male of a brilliant blue on the upperside. When flying in the sun it looks like a sapphire taken to wings.

318. *PITHECOPS DIONISIUS, Boisduval.

Grose Smith. This species is, as far as I know, confined to the Papuan region.

319. UNA USTA, Distant.

HABITAT: Cachar; Myitta and the Daunat Range, Tenasserim, Burma; the Malay Peninsula; N.-E. Sumatra.

EXPANSE: ♀, ·95 of an inch.

DESCRIPTION: FEMALE. UPPERSIDE, *forewing* with the costa, apex, and outer margin broadly brown, the posterior half of the discoidal cell to the inner margin delicate cerulean-blue, which becomes slightly darker towards the base of the wing. *Hindwing* brown, with the exception of a linear spot in the outer half of the discoidal cell, which is covered with bluish scales. UNDERSIDE, *both wings* as in the male, only somewhat paler. *Cilia* grey-brown. *Abdomen* on the underside yellowish-white.

Found in Sumatra at Bekantschan and in the Battak mountains from whence the unique female described above in Dr. Martin's collection was captured in December, 1894. It is never common, but is more plentiful on the river banks at Soengei Batoe in August and September than elsewhere.

320. NEOPITHECOPS ZALMORA, Butler.

To the synonyms of this species already given in Butt. India, vol. iii, p. 53 (*Pithecops dharma*, Moore; *Parapithecops gaura*, Moore; and *Neopithecops horsfieldi*, Distant), may now be added *Cupido talmora* Druce, Proc. Zool. Soc. Lond., 1873, p. 348, n. 4, from Borneo (this species appears to be a MS. name of Mr. Butler's which was never published), and *Plebeius lucifer*, Röber, Iris, vol. i, p. 61, pl. iv, fig. 5 (1888), from the Aru and Key Isles, of which Herr Röber has kindly sent me a specimen from Aru. In Sumatra it is found over our whole area, in the plains (Stabat) and in the mountains (Bekantschan), but is never as common as *P. hylax*, Fabricius. The female, says Dr. Martin, possesses on the upperside of the forewing beyond the discoidal cell a faint blue patch similar to that in the same sex of *P. mariæ*, de Nicéville.

321. SPALGIS NUBILUS, Moore.

Originally described from the Andaman Isles. It may be known from the common Indian and Ceylonese *S. epius*, Westwood, by the discal spot on the upperside of the forewing in the male being ochreous instead of whitish; the female of *S. nubilus* is marked like the male, in *S. epius* the female has the disc of both wings on the upperside more or less whitish. *S. nubilus* is also found in Burma, Java, and Borneo. Mr. Moore has incorrectly recorded *S. epius* from Mergui, Lower Burma; the species should be *S. nubilus*, which occurs in Burma as far north as Chittagong. In Sumatra it is very rare, Dr. Martin has only seen three specimens during his long stay in the island, two taken in October in the forest near Namoe Oekor, and one in forest near Selesseh in January. Perhaps *S. nubilus* escapes being caught by its small size and dull coloration, and by its resemblance to the common *Paragerydus horsfieldi*, Moore.

322. TARAKA HAMADA, Druce.

Rare, found only at higher elevations south of Bekantschan and Soengei Batoe.

323. TARAKA MAHANETRA, Doherty.

Originally described from Padang Rangas, Perak, in the Malay Peninsula. Excessively rare, and found in Sumatra only in the deepest forest. Dr. Martin possesses three specimens, a male from near Selesseh taken in June; and a pair from Bekantschan, the male taken in September, the female in July.

324. MEGISBA MALAYA, Horsfield.

Snellen as *Plebejus* [sic] *malaya*. Hagen. The Sumatran form is typical, the hindwing being tailed. It is not common, but is found all over our area. The males may be captured on small puddles on the forest roads; the females are very rare, and are only met with singly in the forest on flowers and shrubs. Found in Namoe Oekor from July to September.

325. CYANIRIS AKASA, Horsfield.

Grose Smith. Hagen. Not uncommon in the Battak mountains.

326. CYANIRIS COSSÆA, de Nicéville.

C. cossæa, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. ix, p. 271, n. 9, pl. O, figs. 14, *male*; 15, *female* (1895).

Occurs at Namoe Oekor commonly.

327. CYANIRIS CORYTHUS, de Nicéville.

C. corythus, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. ix, p. 273, n. 10, pl. O, figs. 16, *male*; 17, *female* (1895).

Not rare in the Battak mountains in September and December.

328. CYANIRIS PUSPA, Horsfield.

Hagen as *cagaja* [sic]. Snellen as *cagaya*. Sumatran specimens have the merest trace of white sprinkling on the upperside of both wings in the male, thereby agreeing with *C. lambi*, Distant, from the Malay Peninsula and Nias, and *C. cagaya*, Felder, from the Philippines. I cannot, however, regard *C. lambi* as anything but a synonym of *C. puspa*, that species being very variable, and in the Himalayas embracing a form inseparable from *C. lambi*. *C. cagaya*, Felder, as figured, has the black border to both wings on the upperside somewhat narrower than in Javan specimens of *C. puspa*, from whence it was first described.

329. CYANIRIS CARNA, de Nicéville.

C. carna, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. ix, p. 274, n. 11, pl. O, fig. 18, *male* (1895).

The rarest of all the Sumatran species of the genus. "The infuscation of the costa and apex of the forewing on the underside" is not always present, but the other characters given in the description will suffice to distinguish this species from its allies.

330. CYANIRIS MUSINA, Snellen.

C. musina, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. ix, p. 275, n. 12, pl. O, fig. 19, *male* (1895).

A very common species in Sumatra. I have not been able to obtain typical specimens of this species from Java to compare with Sumatran examples.

331. CYANIRIS PLACIDA, de Nicéville.

Not very common in Sumatra.

332. CYANIRIS CAMENÆ, de Nicéville.

C. camenæ, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. ix, p. 278, n. 14, pl. O, fig. 22, *male* (1895).

The commonest species of the genus occurring in Sumatra.

333. CYANIRIS LIMBATUS, Moore.

Also common.

334. CYANIRIS MELÆNA, Doherty.

Originally described from the Tenasserim Valley, Burma. Very rare in Sumatra, Dr. Martin has obtained two or three specimens only in the Battak mountains. Of the ten Sumatran species of *Cyaniris*, only two occur in the plains, *C. cossæa*, de Nicéville, and *C. puspa*, Horsfield, all the others are found in the mountains at high elevations from Soengei Batoe to the Central Plateau, and on the Plateau itself. *C. akasa*, Horsfield, and *C. corythus*, de Nicéville, are somewhat scarce, *C. carna*, de Nicéville, and *C. melæna*, Doherty, are very rare, whilst the four remaining species are very common and brought in by the collectors in large numbers. The males only are caught on wet spots on roads and on the sandy banks of small hill streams; the very scarce females can only be taken in the forest, where they are looking for and ovipositing on the food-plants of the larvæ, or feeding on the flowers of certain *Compositæ*.

335. *CYANIRIS HARALDUS, Fabricius.

Grose Smith as *Lycænopsis ananga*. Distant. Butler. Kirby as *haraldus* and *ananga*. I have never seen this very rare species. Its record from Sumatra is probably correct, so striking a butterfly is not likely to have been wrongly identified. The *Lycænopsis ananga* of Felder is a synonym of *C. haraldus*. I think it probable that the genus *Lycænopsis* is valid, at any rate the type species is a very different-looking animal to all the species of *Cyaniris* known to me.

336. ZIZERA LYSIMON, Hübner.

Hagen as *karsandra*.

337. ZIZERA GAIKA, Trimen.

The rarest species of the genus occurring in Sumatra as elsewhere.

338. ZIZERA OTIS, Fabricius.

Snellen as *lysizone*. Hagen as *lysizone*. All the three *Zizeras* frequent only open grassy spots, and are found near houses and on fallow land. *Z. lysimon*, Hübner, is very common in the plains, and is nearly ubiquitous, especially so on the flowers of a wild species of thorny *Spinacia* (*Amarantus spinosus*, Linnæus), and on the small yellow flowers of a very common species of *Portulaca*. *Z. gaika*, Trimen (named after a Zulu chief, so Mr. Trimen informs me) is found in the same localities, but is very rare; Dr. Martin took it in his garden at Bindjei. *Z. otis* is found on the Central Plateau, and near Battak villages in the mountains.

339. AZANUS ASIALIS, de Nicéville.

A. asialis, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. x, p. 33, n. 15, pl. S, fig. 22, *male* (1895).

Described from a single example caught in the Battak mountains in July, 1894.

340. LYCÆNESTHES EMOLUS, Godart.

Hagen as *Pseudodypsas* [sic] *bengalensis*.

341. Lycænesthes lycænina, Felder.

Both species of this genus inhabit the plains, and do not occur at the higher elevations. They are common in May near Selesseh on forest roads. *L. lycænina* is the rarer of the two species, and Dr. Martin obtained no female of either.

342. Niphanda tessellata, Moore.

Habitat: Penang, Malay Peninsula; N.-E. Sumatra.

Expanse: ♂, 1·5 inches.

Description: Male. Upperside, *both wings* dark shining purple, with a narrow anteciliary black thread. *Hindwing* with a round marginal black spot in the first median interspace. Underside, *both wings* marked as in the female, but the ground-colour much darker.

The specimen described above was caught by Dr. Martin in his fingers on the Penang Hill in December, 1892, resting on a flower. In Sumatra he has obtained one female at the Saentis Estate, very near the sea, in April, and a second at Namoe Oekor in August.

343. Everes argiades, Pallas.

Snellen as *parrhasius.* Hagen as *parrhasius.* It has been described by Herr N. Kheil from Nias as *Plebeius polysperchinus.* In Sumatra it is common at low elevations in October and November; as usual the males on roads, the females on flowers in small jungle. In his valuable work on the *Rhopalocera* of Nias Island, Herr Kheil calls *Polyommatus bœticus*, Linnæus, the "*cardui*" of the *Lycænidæ*, but *E. argiades* better deserves that epithet as it has a still greater range, occurring in North America under a slightly modified form (as *E. comyntas*, Godart), which *P. bœticus* does not do. Dr. Martin notes that European specimens of *E. argiades* have the spots on the underside of the wings somewhat more prominent than in Sumatran examples.

344. Nacaduba macrophthalma, Felder.

Originally described from Pulo Milu, one of the Nicobar Isles.

345. Nacaduba pavana, Horsfield.

Originally described from Java.

346. Nacaduba kerriana, Distant.

Originally described from Malacca and Singapore, occurs also in Burma.

347. Nacaduba sp.

I possess a single female of a species allied to this group, *i.e.*, it has the basal area of the forewing on the underside unmarked, while all the species of *Nacaduba* enumerated below have an additional basal striga, while all those above named lack this striga; but as the females of all of them are known, the present species cannot appertain to any of them. I refrain from describing it until I have obtained the opposite sex.

348. NACADUBA ATRATA, Horsfield.

Grose Smith. This species = *N. prominens*, Moore.

349. NACADUBA HERMUS, Felder.

This species = *N. viola*, Moore, = *P. unicolor*, Röber, Iris, vol. i, p. 66, pl. v, fig. 4, *male* (1888), described from East Celebes, Ceram, and the Key Islands, of which Herr Röber has sent me a male from Ceram.

350. NACADUBA ANCYRA, Felder.

HABITAT: Amboina (*Felder*); East Pegu (*Elwes*); East and South Celebes, the Aru Isles, Ceram (*Röber*); Palawan; Batjan; Celebes; Cooktown, N.-E. Australia (*Staudinger*); Philippine Isles (*Semper*); S.-E. Borneo, Java, Engano, ? Nicobar Isles (*Doherty*); N.-E. Sumatra; Celebes; Yamna, near Humboldt's Bay, North New Guinea (*coll. de Nicéville*).

EXPANSE: ♀, 1·2 inches.

DESCRIPTION: FEMALE. UPPERSIDE, *forewing* plumbeous; with a large metallic iridescent silvery-blue discal area, which reaches into the posterior half of the discoidal cell, and occupies the base and inner margin of the wing. *Hindwing* plumbeous, but the basal two-thirds overlaid with blue scales; the veins defined with black; the outer margin has a broad black border with its inner edge lunulated between the veins, bearing a series of marginal black spots between the veins, each spot outwardly defined by a fine anteciliary thread, inwardly by a white lunule, except the two larger anal spots which are inwardly crowned with ferruginous; a very fine black anteciliary thread. UNDERSIDE, *both wings* as in the male. *Cilia* white. *Tail* black, tipped with white.

Described from a single example from Sumatra. It has all the appearance of a female of the genus *Catochrysops*, to which genus this species bears a strong superficial resemblance. It has several synonyms, *Nacaduba aberrans*, Elwes, Proc. Zool. Soc. Lond., 1892, p. 626, pl. xliv, fig. 6, *male*; *Plebeius subfestivus*, Röber, Iris, vol. i, p. 64, pl. iv, fig. 33, *male* (1888); *Nacaduba pseutis*, Doherty, Journ. A. S. B., vol. lx, pt. 2, p. 182 (1891); and Dr. O. Staudinger and Herr Georg Semper both suggest that the *Cupido almora* of Druce, Proc. Zool. Soc. Lond., 1873, p. 349, n. 14, pl. xxxii, fig. 7, *male*, from Borneo, is also a synonym, which is probably correct, but I cannot say for certain, as the upperside is alone figured and that very badly, while the description of the underside "Very pale brown, streaked and mottled with white. Hindwing with two black spots at the anal angle as above" is quite inadequate to distinguish the species.

351. NACADUBA NANDA, de Nicéville.

N. nanda, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. x, p. 34, n. 16, pl. S, fig. 23, *male* (1895).

352. NACADUBA NELIDES, de Nicéville.

N. nelides, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. ix, p. 280, n. 16, pl. O, fig. 24, *male* (1895).

353. NACADUBA NOREIA, Felder.

Hagen as *nora*. The *Lycæna nora*, of Felder, from Amboina, has tails, and almost certainly equals *N. ardates*, Moore. *N. noreia* is typically tailless, and was described from Ceylon from a female. I have seen the type at Vienna, and it is what I have called the tailless form of *N. ardates*. *N. noreia* occurs typically in Sumatra. What I consider to be its female, and of which we possess many specimens (all of them to my eyes are obviously females, though Dr. Martin disputes the fact, as he says he has taken them sucking up moisture on damp spots on the roads, a habit quite unknown to female *Lycænidæ*, being confined to the males), is very curiously marked on the underside, having the ground-colour ochreous-yellow or luteous, in both wings with a very prominent marginal series of black spots, those in the forewing of equal size throughout, in the hindwing counting from anteriorly backwards the first and the sixth larger than the rest; within this series of spots is another submarginal obscure fuscous series; no basal or discal markings to both wings whatever. Dr. Martin proposes to call this "species" *Nacaduba lutea*, and has described it in a paper published in Munich entitled "Einige neue Tagschmetterlinge von Nordost-Sumatra, pt. 1, p. 1, n. 1 (1895), and I have figured it from a female in Journ. Bomb. Nat. Hist. Soc., vol. x, pl. S, fig. 24 (1895). In Sumatra also occurs typical *N. ardates*, which is tailed. This I hold to be a dimorphic form in both sexes of *N. noreia*. Its female is most variable, some forms of it from Burma in my collection being marked almost exactly as in *N. lutea*, Martin, the basal and discal markings being almost obliterated. I have not seen any females of true *N. ardates* with tails from Sumatra. The *Plebeius kupu*, Kheil, from Nias = *N. ardates*, Moore.

354. NACADUBA DANA, de Nicéville.

If the species of *Cyaniris* are more restricted to higher elevations, the greater number of *Nacadubas* occur in the plains at low elevations. From the Central Plateau *N. nelides*, de Nicéville, alone occurs, while *N. pavana*, Horsfield, and *N. atrata*, Horsfield, are found on the outer hills. All the other species occur in the plains. *N. macrophthalma*, Felder, *N. kerriana*, Distant, *N. nanda*, de Nicéville, *N. nelides*, de Nicéville, and *N. dana* are rare, the rest are more or less common. All *Nacadubas* are very fond of water, the males are usually captured sucking up this element on damp spots; the females are rare in all the species, and never come to water.

355. *NACADUBA PERUSIA, Felder.

Snellen. Originally described from Amboina. It is quite probable I think that this species will be found to be a synonym of *N. atrata*, Horsfield, which species appears to have been unknown to Dr. Felder.

356. JAMIDES SIRAHA, Kheil.

Plebeius siraha, Kheil, Rhop. Nias, p. 30, n. 91, pl. v, fig. 35, *male* (1884).

Snellen as *Plebejus* [sic] *plato*. Hagen as *bochus*. Originally described from Nias. It is a very distinct species, the male having the lovely metallic steel-blue coloration on the upperside of the forewing reduced to less than half the surface; in *J. bochus*, Cramer, from India and Ceylon, that colour occupies more than two-thirds the surface. *J. siraha* is figured by Distant in Rhop. Malay., p. 222, n. 1, pl. xxi, figs. 19, *male*; 16, *female* (1884), as *J. bochus*, var., from Province Wellesley. In Sumatra it is found all over our area, but is rare everywhere. Dr. Martin has specimens taken in February, April, October and November, and he caught a male at the door of his hospital at Bindjei on a flowering creeper (*Pharbitis nil*, Chois.).

357. LAMPIDES CELENO, Cramer.

Snellen as *celeno* and *agnata*. Grose Smith. Hagen as *celeno* and *malaccanus*. This species is better known under the name of *L. ælianus*, Fabricius. The *L. malaccanus* of Röber, and *L. agnata* of Druce are both synonyms.

358. LAMPIDES CLEODUS, Felder.

Originally described from Luzon in the Philippine Isles. *L. pura*, Moore, described from the Mergui Archipelago in Lower Burma, but which occurs also in Assam, Upper Burma, and Nias Island, is a synonym of *L. cleodus*. In Sumatra it is found at Selesseh and in the Battak mountains.

359. Lampides saturata, Snellen.

Lycæna saturata, Snellen, Tijd. voor Ent., vol. xxxv, p. 137, n. 3 (1892).

Originally described from Java, but not figured. I am not quite sure of the identification, it is difficult to identify species of this genus without good figures. It is one of the commonest species of *Lampides* in the Malay Peninsula, Sumatra, and Java; I possess a very long suite of specimens of it from all these places.

360. Lampides talinga, Kheil.

Plebeius talinga, Kheil, Rhop. Nias, p. 29, n. 86, pl. v, figs. 32, *male*; 33, *female* (1884).

Lampides talinga, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. x, p. 39, n. 18, pl. S, figs. 27, *male*; 28, *female* (1895).

A very small and quite distinct species. Originally described from Nias, and is very common in Sumatra.

361. Lampides elpis, Godart.

Snellen. Hagen as *elphis* [sic], Godardt [sic].

362. *Lampides kankena, Felder.

Snellen. Originally described from Kar Nicobar. I have seen the type specimen, a male, at Vienna. In the Indian Museum, Calcutta, are a pair of specimens from Nankowri, one of the Nicobar Islands, and I possess males from Nias Island and the Philippines. Its occurrence in Sumatra is not at all improbable. It is a very distinct species, has the striæ on the underside arranged as in *L. elpis*, Godart; the male on the upperside is of a very pale silvery-blue.

363. Lampides kondulana, Felder.

Originally described from Kondul Isle, one of the Nicobars. I have seen the type in Vienna. In coloration the male is similar to that sex of the three preceding species, but the black border to the wings on the upperside is reduced to a marginal thread. On the underside the striæ are as in the two last-named species. I possess specimens from Nacondam Island, the Nicobar Isles, Burma, the Malay Peninsula, Sumatra and Java. The "*Cupido*" *cærulea*, Druce, from Borneo, Proc. Zool. Soc. Lond., 1873, p. 349, n. 13, pl. xxxii, fig. 6, *male*, is almost certainly a synonym of this species.

364. Lampides subdita, Moore.

First described from Mergui in Lower Burma. Is not uncommon in Sumatra at Namoe Oekor and in the Battak mountains.

365. Lampides margarita, Martin.

L. margarita, Martin, Einige neue Tagschmetterlinge von Nordost-Sumatra, pt. 2, p. 9, n. 8 (1895).

Occurs very rarely at Bekantschan and in the Battak mountains.

366. *Lampides suidas, Felder.

Hagen. Originally described from Luzon in the Philippines, from whence I possess specimens. We have not obtained it in Sumatra.

367. Lampides bochides, de Nicéville.

L bochides, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. vi, p. 367, n. 16, pl. F, fig. 15, *male* (1891).

Rare, has been obtained at Selesseh and in the Battak mountains.

368. Lampides abdul, Distant.

Very rare in the Battak mountains. Originally described from a unique female from Malacca in Dr. O. Staudinger's collection, which I have examined at Dresden. The male, which is of a peculiar shade of metallic green on the upperside, is the *L. marakata* of Doherty, described from Padang Rangas, Perak, Malay Peninsula, in Butt. India, vol. iii, p. 174 (1890).

369. Lampides lucide, de Nicéville.

L. lucide, de Nicéville, Journ. A. S. B., vol. lxiii, pt. 2, p. 33, n. 29, pl. v, fig. 3, *male* (1894).

Excessively rare, Dr. Martin has only obtained a few specimens in the Battak mountains, of which four males are in my collection. All the Sumatran *Lampides*, with the exception of one species, are true forest butterflies, which greatly enliven and cheer the gloomy evergreen primeval forests by the vivid and brilliant coloration of their wings. So perhaps they to some extent compensate for the observed poverty of blue flowers in the forest which has been noted by many writers. *L. celeno*, Cramer, like species of *Nacaduba*, *Catochrysops*, *Everes* and many other *Lycænidæ*, is found on wet spots on the roads. *L. lucide*, the most distinct of the Sumatran *Lampides*, occurs only on the Central Plateau. *L. margarita*, Martin, *L. bochides*, de Nicéville, and *L. abdul* [*recte abdula*, and so given in the Index to the plates of Mr. Distant's book] are found at higher elevations, from Bekantschan to the Plateau; while the remaining species are inhabitants of the forests of the alluvial plain. *L. celeno*, *L. saturata*, Snellen, *L. talinga*, Kheil, *L. elpis*, Godart, and *L. kondulana*, Felder, are common; *L subdita*, Moore, *L. cleodus*, Felder, and *L. bochides* are scarce; while *L. margarita*, *L. abdul*, and *L. lucide* are very rare.

All the *Lampides* are very restless and quick on the wing, and never settle for a long time, consequently from the denseness of the plant-growth in the forest are not easily captured.

370. CATOCHRYSOPS STRABO, Fabricius.

Hagen as *strabo*, Fabricus [sic] and *kandarpa*. Staudinger as *kandarpa*. The *C. kandarpa* of Horsfield is a synonym of *C. strabo*.

371. CATOCHRYSOPS LITHARGYRIA, Moore.

First described from Ceylon, but found also in Assam, Burma, the Andaman Isles, and the Philippine Isles.

372. CATOCHRYSOPS CNEJUS, Fabricius.

Snellen. The three species of *Catochrysops* in Sumatra occur at the lower elevations, and are not found higher than Bekantschan. The males of *C. strabo*, Fabricius, and *C. lithargyria*, Moore, are very common on roads, where they act as miniature scavengers, but the females must be sought for in gardens or small jungle. The males of *C. strabo* in particular occur in large numbers, thirty to fifty specimens, on the margins of puddles, and form beautiful violet patches of colour on the sunny roads. *C. lithargyria* is a little rarer than *C. strabo*, and may be considered to be a good species, Dr. Martin noting that he possesses females probably of this species which differ slightly in the shade of blue on the upperside of both wings from undoubted females of *C. strabo*. *C. cnejus* is quite as common as *C. strabo*, but is seldom found on roads as it prefers gardens in which the common Chinese bean (*Vigna sinensis*, Savi.) is cultivated, on the flowers of which the larva feeds. The figures of *C. strabo* and *C. cnejus* in Distant's Rhop. Malay. are not good, being far too reddish in shade on the upperside. The widely distributed *C. pandava*, Horsfield, which is common at Singapore, and is the most plentiful of all the Nicobarese butterflies, is strangely enough apparently absent from Sumatra.

373. CASTALIUS ROSIMON, Fabricius.

Grose Smith. Hagen.

374. CASTALIUS ANANDA, de Nicéville.

First described from Sikhim, occurs also in Assam, Upper Burma, Orissa, and South India.

375. CASTALIUS ETHION, Doubleday and Hewitson.

Grose Smith. Snellen. Hagen. Distant.

376. CASTALIUS ROXUS, Godart.

Hagen as *roxus*, Godardt [sic]. Staudinger.

377. CASTALIUS ELNA, Hewitson.

Widely distributed, found in North-Eastern and Southern India, Burma, the Andaman Isles, the Malay Peninsula, and Java. *C. rosimon*, Fabricius, *C. ethion*, Doubleday and Hewitson, *C. roxus*, Godart, and *C. elna* occur in the plains and outer hills south of Bekantschan and Bohorok. *C. rosimon*, *C. roxus*, and *C. elna* are found on roads and grassy places such as forest tracts overgrown with high grass, and settle with folded wings on the ground if moist, or on the tops of flowering *Gramineæ*. *C. ethion* keeps more to low shrubs, and is found inside the forest. *C. ananda*, de Nicéville, is only found in the forest on certain bushes in February and March. Dr. Martin took it, also in March and April, at Singla below Darjiling in the Western Himalayas only on certain trees, but I have caught the male in the same place on the wet sand in the beds of streams. The female of *C. ethion*, which has no blue coloration on the upperside of both wings, is so far quite similar to the male of *C. roxus*, our most common species, but the markings of the underside will instantly distinguish them. *C. elna*, the largest of our *Castalius*, is decidedly rarer than *C. rosimon*, *C. ethion*, and *C. roxus*; *C. ananda* is the rarest of all, and found only at the higher elevations.

378. POLYOMMATUS BŒTICUS, Linnæus.

Snellen. Hagen. Distant as *bæticus* [sic]. This widely-spread butterfly occurs in Sumatra near the sea, as Dr. Martin has taken it at the Saentis Estate and at Loboe Dalam on the flowers of the common kidney bean (*Phaseolus vulgaris*, Linnæus), and also very high in the mountains at Soengei Batoe and on the Central Plateau, but it is never found in the intermediate area. Dr. Martin is quite unable to account for this fact, which has also been observed by Dr. Hagen, who has taken *P. bœticus* near Laboean on abandoned Indigo plants, and believes that the butterfly was imported to this very low elevation from Singapore when the Malays first introduced the Indigo plant from thence.

379. *CUPIDO ÆTHERIALIS, var.

Hagen. I am unable to trace this species.

380. *LYCÆNA AUGUSTA.

Grose Smith. I have failed to discover this species also.

381. *LYCÆNOPSIS CYLINDE, Boisduval.

Grose Smith. Originally described from Dorei, New Guinea. Unless the type of this species still exists in M. Charles Oberthür's collection, it will be impossible to identify it from Boisduval's short description.

382. AMBLYPODIA NARADA, Horsfield.

Hagen. Grose Smith as *anita*. The *A. anita* of Hewitson was originally described from Siam, and is the common Indian and Ceylonese species. The coloration of the male on the upperside of both wings is more purple than blue, and it is not found south of Burma. *A. narada* is rich deep blue, and occurs in the Malay Peninsula. In Sumatra it is by no means common in the forests of the plains, and Dr. Martin possesses other specimens from Asahan and Indragiri. Dr. Martin notes that he has some very small examples of both sexes with a broader brown margin to the upperside of the forewing, and the markings of both wings on the underside more prominent, than in typical specimens.

383. IRAOTA ROCHANA, Horsfield.

Originally described from Java. The *I. boswelliana* of Distant, described from Penang and Singapore, is a synonym of this species. Dr. Martin remarks that the male has three tails. As figured by Horsfield and Moore in Cat. Lep. Mus. E. I. C., vol. i, p. 44, n. 68, pl. i*a*, fig. 10, *male* (1857), there are only two.

384. IRAOTA NILA, Distant.

HABITAT: Malacca (*Distant*); N.-E. Sumatra.

EXPANSE: ♂, 1·4 to 1·6 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* black, with rich purple markings. *Forewing* with a streak occupying the middle of the discoidal cell for its whole length; two short streaks in the median interspaces, a very large one in the submedian interspace bisected by the submedian fold, not reaching the outer margin; a short streak at the base of the sutural area. *Hindwing* with the disc purple divided by the black veins; the costa and abdominal margin rather broadly pale fuscous; *tails* two, of equal length, short, narrow, black tipped with white. UNDERSIDE, *both wings* coloured and marked as in the female. *Antennæ* black, the tip of the club above gamboge-yellow, beneath also of the same colour, but gradually merging into the ferruginous colour of the middle and base of the club. *Head* with two white lines across the face, the orbits white. *Palpi* with the apex black, the base white. *Abdomen* above black, beneath whitish.

After all, this species turns out to be a true *Iraota*, though it is somewhat aberrant, as both sexes have two tails (in *I. rochana* the male has two [Dr. Martin says three] and the female three tails; in *I. timoleon*, Stoll, and allies the male has one and the female two tails), and the shape of the wing differs also somewhat from typical *Iraotas* in both sexes. The neuration, however, is quite normal. In Sumatra both the species of *Iraota* are rare, the males even more so than the females. Dr. Martin took the first male of *I. rochana*, Horsfield, a very large specimen, measuring 1·7 inches, at Namoe Oekor in August, 1892, and the first male of *I. nila* near Bekantschan in October, 1893. We have other specimens taken at Selesseh in July, and in the Battak mountains in September.

385. SURENDRA AMISENA, Hewitson.

Grose Smith. Hagen.

386. SURENDRA FLORIMEL, Doherty.

Originally described from Lower Burma.

387. *SURENDRA VIVARNA, Horsfield.

Hagen. Originally described from Java, from whence I have a good series of both sexes. *S. amisena*, Hewitson, and *S. florimel*, Doherty, both occur at low elevations in the forests of the plains, the former is very common near Selesseh, the latter much rarer. The males of the two species must be differentiated by the markings of the underside of the wings. In habits they resemble those of the following genus.

388. ARRHOPALA CENTAURUS, Fabricius.

Butler. Distant. Occurs in the sultanate of Indragiri.

389. ARRHOPALA AGNIS, Felder.

Grose Smith. Hagen. The shade of coloration of the upperside of the male is more variable in this species than in any other known to me; in some specimens it is almost pale blue, and there is nearly every gradation to be met with till deep purple is reached completing the series. It is a common species, and is found in Burma, the Malay Peninsula, and Nias; in Sumatra it occurs at Selesseh and in the Battak mountains.

390. ARRHOPALA ACE, de Nicéville.

A. ace, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. vii, p. 329, n. 6, pl. H, fig. 13, *male* (1892).

Originally described from Perak in the Malay Peninsula. I possess a single example from the Battak mountains of Sumatra. It is a very distinct and easily recognised species.

391. ARRHOPALA ADOREA, de Nicéville.

A common species at Bekantschan and in the hills.

392. ARRHOPALA ATOSIA, Hewitson.

Hewitson. Hagen. Grose Smith. Butler. Kirby. Distant. Originally described from Sumatra. A common and easily recognised species.

393. ARRHOPALA AMPHEA, Felder.

Originally described from Luzon in the Philippines. It is near to *A. abseus*, Hewitson, but the male may be known from the same sex of that species by having the purple coloration of both wings on the upperside nearly twice as extensive.

394. ARRHOPALA AROA, Hewitson.

Hewitson. Grose Smith. Butler. Kirby. Distant. Originally described from Sumatra, and is probably the commonest species of the genus found in the island.

395. *ARRHOPALA ATRAX, Hewitson.

Grose Smith. Probably incorrectly identified, as it is strictly confined to India as far as I am aware.

396. ARRHOPALA ADATHA, Hewitson.

A fairly common species in Sumatra.

397. ARRHOPALA PSEUDOMUTA, Staudinger.

Amblypodia pseudomuta, Staudinger, Iris, vol. ii, p. 125 (1889).

Arhopala rafflesii, de Nicéville, Butt. India, vol. iii, p. 248, n. 803, pl. Frontispiece, fig. 136, *male* (1890).

I possess only one specimen of this species from Sumatra.

398. *ARRHOPALA AGESILAUS, Staudinger, var. MAJOR, Staudinger.

Amblypodia agesilaus, Staudinger, var. *major*, Staudinger, Iris, vol. ii, p. 128 (1889).

Staudinger. Described typically and figured (*l. c.*, pl. i, fig. 17, *male*) from Palawan in the Philippine Isles, and the var. *major* from Malacca and Fort de Kock in Sumatra. It appears to be very close to *A. pseudomuta*, Staudinger. We have failed to recognise it.

399. *ARRHOPALA ANUNDA, Hewitson.

Grose Smith. Originally described from Borneo, but unknown to us.

400. ARRHOPALA TEESTA, de Nicéville.

Found at Selesseh and in the Battak mountains. It occurs in Java as well as in India, and may be the same species as *A. turbata*, Butler, from Japan.

401. ARRHOPALA APIDANUS, Cramer.

Grose Smith. Distant. Not rare. As usual with this species, the female in Sumatra is more frequently met with in collections than the male.

402. ARRHOPALA DIARDI, Hewitson.

Grose Smith as *capeta*. Found in the Battak mountains. The "*Amblypodia*" *capeta*, Hewitson, described from Sumatra, is the female of *A. diardi*, of which Hewitson described the male only. The species has a wide range, being found in Assam, Siam, the Malay Peninsula, Sumatra, and Java.

403. ARRHOPALA AZINIS, de Nicéville.

A. azinis, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. x, p. , n. 20, pl. T, fig. 31, *male* (1896).

Described from a single male in Dr. Martin's collection taken at Bekantschan in March, 1894.

404. ARRHOPALA AZATA, de Nicéville.

A. azata, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. x, p. , n. 21, pl. T, figs. 32, *male*; 33, *female* (1896).

Occurs also in Perak in the Malay Peninsula; in Sumatra it has been taken in March, July, and November.

405. ARRHOPALA ANTHELUS, Doubleday and Hewitson.

This fine species occurs at Selesseh in Sumatra, and I possess specimens also from Java. The males from Sumatra are of a deeper shade of blue on the upperside of both wings than typical specimens from Burma, while Javan specimens are normally coloured.

406. *ARRHOPALA ANARTE, Hewitson.

Hagen. Grose Smith as *anartes* [sic]. Kirby. Distant. This species doubtless occurs in Sumatra, though we have never met with it. It is found in Burma, the Malay Peninsula, and Borneo.

407. *ARRHOPALA AUXESIA, Hewitson.

Hewitson. Kirby. Originally described from Sumatra, but we have not met with this fine species. *A. auxea*, de Nicéville, from Java, is a local race of *A. auxesia.*

408. ARRHOPALA BUXTONI, Hewitson.

Hewitson. Grose Smith. Staudinger. Distant. Originally described from Sumatra, where it is found at Selesseh.

409. ARRHOPALA FARQUHARI, Distant.

Snellen as *eumolphus*. Hagen as *eumolphus*. Grose Smith as *eumolphus*. The *A. eumolphus* of Cramer was described from the Bengal Coast, so it appears best to retain that name for the Eastern Himalayan, Assamese, and Chittagong Hill Tracts form. Its female is the *A. bupola* of Hewitson. The female of *A. farquhari* is probably the *A. maxwelli* of Distant. Snellen suggests that *A. atosia*, Hewitson, is the female of the Sumatran form; in this I cannot agree with him, *vide* Butt. India, vol. iii, p. 242. I possess a long series of *A. adonias*, Hewitson, from Java from whence it was originally described. All my specimens appear to be females, and as the markings of the underside agree closely with those of *A. eumolphus*, *A. farquhari*, *A. hellenore*, Doherty, and *A. horsfieldi*, Pagenstecher, I am inclined to believe that its male is a green species which does not appear to differ at all from the same sex of *A. farquhari*, though the Javan female (true *A. adonias*) is of quite a different shade of colour on the upperside of both wings, being a pale silvery blue, to the deep purple coloration of the female of the true *A. farquhari* from Burma, the Malay Peninsula, Sumatra, and Borneo. In Sumatra *A. farquhari* is found at Bekantschan and in the Battak mountains.

410. ARRHOPALA TROGON, Distant.

Originally described from Perak in the Malay Peninsula. Very rare in both sexes, but the female seems to be more often met with than the male.

411. ARRHOPALA HORSFIELDI, Pagenstecher.

Amblypodia horsfieldi, Pagenstecher, Jahr. des Nass. Ver. für Naturk., vol. xliii, pp. 99, 106 (1890).

Arhopala basiviridis, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. vi, p. 373, n. 21, pl. G, fig 22, *male* (1891).

Originally described from East Java by Pagenstecher, and from the Malay Peninsula and Borneo by myself. In Sumatra it is found in the Battak mountains.

412. Arrhopala anniella, Hewitson.

Originally described from Singapore from a male. From superficial appearances only one would say that the *A. artegal* of Doherty from Mergui in Lower Burma is a synonym of this species. Against this is the fact that Doherty described his species from two male specimens, while the description and figure agrees with the female of *A. anniella*. In Sumatra *A. anniella* occurs in the Battak mountains.

413. Arrhopala singhapura, Distant.

Originally described from Singapore. Dr. Martin writes to me that he possesses this species from Sumatra, that it is a good species, and is very different from *A. anniella*, Hewitson, as it has a blunt and broad tail tipped with white, and is a smaller insect. On the underside *A. anniella* has white scales which are entirely wanting in *A. singhapura*, of which also the metallic green markings near the anal angle of the hindwing are largely different and more prominent, also shaped differently to those in *A. anniella*. The markings on the underside of *A. singhapura* are also much nearer to those of *A. diardi*, Hewitson, than to those of *A. anniella*. Till I received this note from Dr. Martin I thought that *A. singhapura* might be a synonym of *A. anniella*, Distant having figured the female of the former and the male of the latter.

414. *Arrhopala inornata, Felder.

Grose Smith. I have failed to recognise this species from any locality.

415. *Arrhopala perimuta, Moore.

Grose Smith. This is a very distinct and easily recognised little species, and Mr. Grose Smith is not likely to have wrongly identified it. I have no record except the above of its occurrence south of Mergui in Lower Burma.

416. Arrhopala morphina, Distant.

Very rare, found in the Battak mountains only. It is one of the most beautiful and distinct species in the genus, and was originally described from Perak in the Malay Peninsula.

417. Arrhopala ovomaculata, Hewitson.

Originally described from Sumatra. It occurs in the Battak mountains rarely in August.

418. ARRHOPALA AGESIAS, Hewitson.

Grose Smith. Originally described from Borneo. I possess one example only from Sumatra. Hewitson describes four discal spots on the underside of the forewing, but he figures five, while my specimen has six.

419. ARRHOPALA ANILA, de Nicéville.

A. anila, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. x, p. , n. 22 (1896).

I have thus named the variety *a* of Hewitson's *A. agesias*, as I see no reason why it should not be a quite distinct species. It occurs in the Malay Peninsula, at Namoe Oekor in Sumatra in August, and in Borneo.

420. ARRHOPALA METAMUTA, Hewitson.

Grose Smith. Butler. Kirby. Distant. Originally described from Sumatra, where it does not appear to be at all a common species.

421. ARRHOPALA HYPOMUTA, Hewitson.

Grose Smith. If I have correctly identified this species, it is common in Sumatra.

422. ARRHOPALA AMPHIMUTA, Felder.

Hagen. I possess one male specimen from Sumatra, which I identify a little doubtfully as this species.

423. ARRHOPALA ANTIMUTA, Felder.

Snellen. A common species. It has no tail, and is easily recognised from *A. atosia*, Hewitson, which is tailed, by this feature. Both species have a patch of differently-formed scales in the middle of the forewing on the upperside in the male.

424. ARRHOPALA DAVISONII, de Nicéville.

A very common species in Sumatra as elsewhere.

425. ARRHOPALA AVATHA, de Nicéville.

A. avatha, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. x, p. , n. 23, pl. T, fig. 34, *male* (1896).

Differs from *A. davisonii*, de Nicéville, in having the black margin to both wings on the upperside in the male twice as broad.

426. ARRHOPALA ASIA, de Nicéville.

Arhopala asia, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. vii, p. 333, n. 9, pl. H, fig. 16, *male* (1892).

Originally described from the Malay Peninsula. I possess several male specimens from Sumatra which agree with the type.

427. ARRHOPALA (*Acesina*) AMMON, Hewitson.

Originally described from Singapore. Occurs in Sumatra in the Battak mountains.

428. ARRHOPALA (*Mahathala*) AMERIA, Hewitson.

Hagen. Not uncommon; as usual, the females are more often met with than the males. This genus is the one most largely represented in Sumatra, which may perhaps be its head quarters, though the Malay Peninsula may possibly possess quite as many species. All are found in forests, but nevertheless their more or less metallic blue, purple, and green colours are not at all conspicuous and they do little to enliven the somber depths of the forest, as the restless species of *Lampides* do. *Arrhopalas* never come to small streams or damp spots on roads to suck up the moisture, or to flowers, they hardly ever fly unless disturbed, and as they always settle with folded wings, of which the undersides present only dull brown, grey, or dull purple colours, little is seen of them. They rest on leaves of shrubs of moderate height, and never fly for any length of time or to a distance, feeling themselves much more secure when at rest. There is therefore only one way to see and capture them, and that is to walk through the underwood and disturb them by beating the bushes and low trees, and thus to cause them to fly. The following species are found only in the mountains at high elevations:—*A. azinis*, de Nicéville, *A. azata*, de Nicéville, *A. teesta*, de Nicéville, *A. anthelus*, Doubleday and Hewitson, *A. ovomaculata*, Hewitson, *A. ammon*, Hewitson, and *A. morphina*, Distant. All the rest occur in the plains. *A. centaurus*, Fabricius, so common elsewhere, we have never seen in Deli, but Dr. Friedl Martin took a single specimen at the Gading Estate in Indragiri, south of Siak, in November, 1894. The rarest species are *A. amphea*, Felder, *A. anniella*, Hewitson, *A. diardi*, Hewitson, and *A. morphina*, Distant. Of the three metallic green species none is common, but *A. farquhari*, Distant, is less scarce than *A. horsfieldi*, Pagenstecher, whereas *A. trogon*, Distant, is the rarest of the three, Dr. Martin in thirteen years' collecting having obtained only two specimens.

429. CURETIS MALAYICA, Felder.

Hagen. Originally described from Malacca.

430. CURETIS ÆSOPUS, Fabricius.

Originally described from the East Indies.

431. CURETIS FELDERI, Distant.

Originally described from Province Wellesley and Sungei Ujong in the Malay Peninsula.

432. CURETIS SPERTHIS, Felder.

Hagen. Originally described from Malacca. We have followed Mr. Distant's identifications of these four species, as we have specimens from Sumatra which agree with his descriptions and figures of them. Whether they are all distinct, or how many of them are so, we are not prepared to say. The males are far more commonly met with than the females; which latter have the upperside of the wings orange bordered with black, never with the orange colour replaced by white, the more usual form of the Indian species.

433. CURETIS INSULARIS, Horsfield.

A well marked, easily identified, and probably valid species originally described from Java.

434. *CURETIS BULIS, Doubleday and Hewitson.

Snellen. Typically not met with by us in Sumatra.

435. *CURETIS BARSINE, Felder.

Hagen. Originally described from Amboina. Not met with by us in Sumatra. All species of *Curetis* in Sumatra occur at low elevations with the exception of *C. malayica*, Felder, which is found in the mountains as well as in the plains. The males usually rest with closed wings on leaves near small streams, never fly for long distances, and do not go down to wet spots on roads very often, though the males are sometimes so found. The females are occasionally only caught in the forest. Their flight is so rapid that they can hardly be followed with the eye, but if they settle on the upperside of a leaf with closed wings their silvery-coloured underside at once betrays them, but if they are frightened they settle on the underside of the leaves, where they are of course invisible.

436. *ZEPHYRUS ABSOLON, Hewitson.

Z. absolon, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. ix, p. 291, n. 23, pl. P, figs 33, *male*; 34, *female* (1895).

Recorded by me from West Java; recently captured by Dr. Hagen on Mount Kaba, 5,200 feet, in South Sumatra. He saw seven or eight specimens, but caught only one male, which Dr. Martin has seen.

437. **ILERDA ILA**, de Nicéville, n. sp.

Hagen as *epicles*, Godardt [sic].

HABITAT: Battak mountains, N.-E. Sumatra.

EXPANSE: ♂, 1·4 to 1·5; ♀, 1·5 to 1·6 inches.

DESCRIPTION: MALE. UPPERSIDE, *forewing* differs from typical *I. epicles*, Godart, from Java, in the iridescent deep purple colour being of greater extent, approaching much nearer the costa and the outer margin; never with a diffused yellow patch beyond the end of the discoidal cell. *Hindwing* with the purple coloration of greater extent also, the orange lunules on the margin greatly reduced in size and fewer, confined more to the anal angle. UNDERSIDE, both wings as in *I. epicles*. FEMALE. UPPERSIDE, *forewing* differs from typical *I. epicles* in having the orange area much larger, almost reaching the base of the wing. *Hindwing* differs in having a very large continuous orange area occupying the outer half of the wing, instead of a series of conjoined broad marginal lunules, with sometimes a small indistinct diffused orange patch on the disc. UNDERSIDE, *both wings* as in the male.

It is possible that "*Thecla*" *phœnicoparyphus*, Holland, described from Hainan Island, (the type being said to be a male but probably actually a female) is the name which will have to be applied to the Western Chinese and Indian form of *I. epicles*, as from the figure and description of the type of that species, the orange areas on the upperside of both wings appear to be of about the same extent; the forewing, however, has the orange area (though it is variable in extent) always less than half as large as it is in true *I. epicles*. *I. ila* differs from both in the female by the orange area on the upperside of the hindwing occupying fully half the surface instead of being confined to a marginal band.

I. ila is not very common on the Central Plateau, but occurs throughout the year, as there are specimens in Dr. Martin's collection taken in every month. I have described it from a long series of both sexes.

438. **DACALANA VIDURA**, Horsfield.

Grose Smith. Hagen. Distant. Occurs in the plains and on the outer hills. Is common at Selesseh in April. The collectors brought in perhaps five or six males to one female.

439. CAMENA CIPPUS, Fabricius.

I have caught this species at Selesseh in October, but it is very rare in Sumatra, as Dr. Martin possesses only one other specimen taken in July also near Selesseh.

440. CAMENA COTYS, Hewitson.

Originally described from Nepal. It is very rare in Sumatra, I possess two males only. Probably often overlooked owing to its strong superficial likeness to the more common *Dacalana vidura*, Horsfield.

441. CAMENA CRETHEUS, de Nicéville.

C. cretheus, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. ix, p. 294, n. 24, pl. P, fig. 35, *male* (1895); idem, id., l. c., vol. x, p. , n. 24, pl. T, fig. 35, *female* (1896).

Very rare, occurs in the Battak Mountains of Sumatra in March, and in Western Java. Easily recognised by the base of the costa of the forewing on the underside being yellow.

442. APHNÆUS LOHITA, Horsfield.

Grose Smith. A common species, spread over the whole of our area with the exception of the Central Plateau; the males on roads, on the margins of forest, and also on grassy places; females somewhat scarcer. They are very fond of executing the rubbing and revolving movements of the hindwings observed in many of the *Lycænidæ*.

443. *APHNÆUS SYAMA, Horsfield.

Staudinger. As this species occurs in the Malay Peninsula and in Java, it is almost certainly found also in the intervening island of Sumatra, though we have never met with it.

444. *APHNÆUS VULCANUS, Fabricius.

Hagen. Occurs commonly in Java, and is almost certainly to be found in the south-east of Sumatra, which is only separated from Java by a narrow and shallow strait.

445. APHNÆUS HIENDLMAYRII, de Nicéville.

A. hiendlmayrii, de Nicéville, Journ. A. S. B., vol. lxiii, pt. 2, p. 38, n. 33, pl. v, fig. 5, *female* (1894).

Very rare, only three female specimens have been obtained in March and August at Selesseh. The male still remains to be discovered.

446. TAJURIA BURBONA, Hewitson.

Myrina burbona, Hewitson, Ill. Diurn. Lep., *Lycænidæ*, p. Supplement 24, n. 66, pl. Supplement iii*a*, fig. 95, *female* (1878).
Charana datoe, Martin.

Hewitson. Hagen as *jalindra*. Staudinger as *jalindra*. Grose Smith. Originally described from Sumatra. It is a local race of *T. jalindra*, Horsfield, from Java, *T. indra*, Moore, from India, and *T. tarpina*, Hewitson, from the South Andaman Isles. The male of the Sumatran race has the black border to the forewing on the upperside narrower than in the allied species. Dr. Martin described the male, Hewitson the female. Only a few males obtained in forest near Selesseh in April, May and June; no female.

447. *TAJURIA LONGINUS, Fabricius.

Staudinger. Found on both sides of Sumatra—in Java and in the Malay Peninsula—so it is almost certain to occur in Sumatra also.

448. TAJURIA MANTRA, Felder.

From Namoe Oekor to Bekantschan; is rarer than the species which next follows.

449. TAJURIA TRAVANA, Hewitson.

Grose Smith. Distant. Staudinger. Kirby. Butler. Originally described from Sumatra and Borneo. Common at low elevations in Sumatra.

450. TAJURIA TURA, de Nicéville.

T. tura, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. ix, p. 301, n. 27, pl. P, fig. 39, *male* (1895).

Found very rarely in August in the Battak Mountains of Sumatra, and in Western Java.

451. TAJURIA TYRO, de Nicéville.

T. tyro, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. ix, p. 302, n. 28, pl. P, fig. 40, *female* (1895).

Occurs rarely in Burma and Sumatra.

452. *TAJURIA ISÆUS, Hewitson.

Grose Smith. Kirby. Originally described from Sumatra and Sarawak in Borneo. We have seen no specimen of it from Sumatra. See remarks below, No. 458.

453. Tajuria thria, de Nicéville.

T. thria, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. x, p. , n. 26, pl. T, figs. 38, *male*; 39, *female* (1896).

Found in Tenasserim, Burma, and the Battak Mountains south of Bekantschan, Sumatra, in March, May and July. It is rare, and may easily be distinguished from its allies by the male being entirely black on the upperside of the forewing.

454. Tajuria blanka, de Nicéville.

T. blanka, de Nicéville, Journ. A. S. B., vol. lxiii, pt. 2, p. 39, n. 34, pl. iv, fig. 4, *female* (1894).

Two females of this very rare species have been obtained in the higher mountains; the type specimen in October, 1893.

455. Tajuria donatana, de Nicéville.

Originally described from Burma. Two male specimens only have been obtained in March and July at Bekantschan at the foot of the Battak mountains in Sumatra. This species is quite distinct from the Celebesian species, *T. orsolina*, Hewitson, to which it is nearly allied.

456. Ops ogyges, de Nicéville.

O. ogyges, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. ix, p. 298, n. 25, pl. P, figs. 36, *male*; 37, *female* (1895).

Originally described from Maulmain in Burma. Very rare, Dr. Martin obtained one male specimen in the Battak mountains in September, 1894, which I have not seen.

457. Ops melastigma, de Nicéville.

In *O. ogyges*, de Nicéville, the "male-mark" on the disc of the forewing on the upperside is indistinct, and can be seen only in certain lights. In *O. melastigma* it is exceedingly prominent, quadrate, and dingy black or fuliginous in colour. It is very rare in Sumatra, Dr. Martin possesses a single male taken in the Battak mountains in December.

458. Britomartis cleoboides, Elwes.

B. cleoboides, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. ix, p. 306, n. 1 (1895).

Messrs. Grose Smith and Kirby have both recorded *Tajuria isæus*, Hewitson (see No. 452) from Sumatra, but probably the specimens so identified should be the present one, which has only recently been described. The true "*Iolaus*" *isæus*, the type specimen of which was probably from Sumatra (Hewitson gives Sumatra and Sarawak as the habitat of *I. isæus* on page 44 of Ill. Diurn. Lep.), is a *Tajuria*. It was described from a male, its female being probably the *T. relata* of Distant. Hewitson in Supplement page 10 of the above-quoted work described a male *I. isæus* (which I identify as *Britomartis cleoboides*, Elwes), from Borneo, and said, incorrectly as I believe, that his first description and figure instead of applying to a male should be to a female. To sum up:—"*Iolaus*" *isæus*, and *Tajuria relata*, Distant, stand as *Tajuria isæus*, Hewitson, male and female, from the Malay Peninsula and Sumatra; while Hewitson's second figure of "*Iolaus*" *isæus* in the supplement of his book, which is also taken from a male, stands as *Britomartis cleoboides*, Elwes, from Burma, Sumatra, Java and Borneo. It is rare in Sumatra, found in June and July at Selesseh.

459. BRITOMARTIS BUTO, de Nicéville.

B. buto, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. ix, p. 308, n. 29, pl. P, fig. 41, *female* (1895).

Occurs in Burma and Sumatra; described from a single example from each locality.

460. SUASA SUESSA, de Nicéville.

S. suessa, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. vii, p. 337, n. 14, pl. H, figs. 8, *male*; 9, *female* (1892).

Originally described from the Malay Peninsula. Found very rarely in the Battak mountains from Namoe Oekor to Bekantschan in December and January, and again in July.

461. *THAMALA MARCIANA, Hewitson.

Butler. Kirby. Grose Smith. Originally described from Sumatra, and Sarawak in Borneo, but not obtained by us. It almost certainly occurs in Sumatra, as it is found in the countries on both sides of it.

462. HYPOLYCÆNA ERYLUS, Godart.

Hagen as *erylus*, Godardt [sic]. Common at low elevations and throughout the year. The female is very rare.

463. HYPOLYCÆNA THECLOIDES, Felder.

Staudinger. Very rare, only two specimens obtained, both females, one at Selesseh, the other in Indragiri in February.

464. HYPOLYCÆNA SIPYLUS, Felder.

I possess a single worn female example from Sumatra which appears to represent this species. It occurs also in Celebes and Amboina, the allied *H. tharrytas*, Felder, being found in the Philippines.

465. CHLIARIA TORA, Kheil.

C. tora, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. ix, p. 311, n. 31, pl. P, fig. 43, *female* (1895).

Originally described from Nias; occurs also in the Malay Peninsula in Perak, in Sumatra at Selesseh and Bekantschan, and in Borneo. It flies in every month in the year in Sumatra; the males are found with different species of *Nacaduba*, &c., on wet spots on roads.

466. CHLIARIA MERGUIA, Doherty.

Originally described from Lower Burma. Found in Sumatra from Bekantschan to the higher Battak mountains in the last three months in the year, but is a rare species.

467. CHLIARIA AMABILIS, Martin.

C. amabilis, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. ix, p. 309, n. 30, pl. P, fig. 42, *male* (March, 1895); *Zeltus amabilis*, Martin, Einige neue Tagschmetterlinge von Nordost-Sumatra, pt. 2, p. 11, n. 9 (October, 1895).

Found in Java. In Sumatra it flies from Selesseh to Bekantschan in June, July and August. Rare, Dr. Martin has obtained five or six specimens only.

468. ZELTUS ETOLUS, Fabricius.

Hagen. Grose Smith. Found all over our area and is everywhere common, the males on wet roads, the females much scarcer and flying in the jungle. Dr. Martin has made the same observation that I did fourteen years ago when I first saw this butterfly alive (Journ. A. S. B., vol. l, pt. 2, p. 59, n. 105 (1881) that "The male when flying over small puddles of water reminds one very much of a common blue-bodied dragonfly."

469. NEOCHERITRA AMRITA, Felder.

Grose Smith. Snellen. Hagen. Occurs in the mountains south of Bekantschan in July. We have never seen a male, and the female is rare.

470. NEOCHERITRA NAMOA, de Nicéville.

N. namoa, de Nicéville, Journ. A. S. B., vol. lxiii, pt. 2, p. 41, n. 86, pl. v, fig. 9, *male* (1894).

Described from a unique male captured in the Battak mountains in May, 1893. Since then a second specimen was obtained in December, 1894, at the same locality by a clever Battak collector named Sinobar.

471. NEOCHERITRA NISIBIS, de Nicéville.

N. nisibis, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. ix, p. 316, n. 33, pl. P, fig. 45, *female* (1895).

Described from two females, one each from the Malay Peninsula and Sumatra.

472. THRIX GAMA, Distant.

This is a very remarkable genus, the male having a somewhat similar tuft of hairs on the upperside of the forewing to that found in the genera *Dacalana* and *Arrhenothrix*. It occurs rarely in Sumatra from Selesseh to Soengei Batoe in May, June and July. The males vary in size from 1·45 to 1·75 inches.

473. MANTO MARTINA, Hewitson.

M. martina, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. ix, p. 314, n. 32, pl. P, fig. 44, *female* (1895).

Originally described from Borneo, but is found also in Burma, the Malay Peninsula and Sumatra. Occurs at low elevations as high only as Namoe Oekor from February to July and again in October.

474. JACOONA ANASUJA, Felder.

Hitherto known only from the Malay Peninsula. The female has still to be discovered. Very rare, only two specimens obtained in thirteen years, both at Selesseh in May.

475. NEOMYRINA HIEMALIS, Godman and Salvin.

Hagen. With the exception of *Arrhopala agnis*, Felder, this is the largest of our *Lycænidæ*. Very rare, as it flies very high and quickly in the forest. Dr. Martin once saw a specimen flying across a small open grassy patch from one piece of forest to another. Its flight was so rapid that its long tails were nearly invisible, and at first sight it gave the impression of being a specimen of the smaller white *Catopsilia* (*C. pyranthe*, Linnæus). It is found over the whole of our area, with the exception perhaps of the Central Plateau. Dr. Martin has specimens from the Gayoe-lands, Selesseh, Deli and Asahan. It is probably less rare in the western part of our area, as at Padang Tjermin in Langkat an amateur collector obtained some ten specimens in one year.

476. TICHERRA ACTE, Moore.

Common from Namoe Oekor to the Central Plateau throughout the year.

477. CHERITRA FREJA, Fabricius.

Hagen as *freya* [sic]. Grose Smith. Still commoner than the foregoing species, and occurs in forest only over the whole of our area.

478. RITRA AUREA, Druce.

R. aurea, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. x, p. , n. 30, pl. T, fig. 45, *female* (1896).

Found in large forest near Selesseh, Namoe Oekor, and from Bandar Kwala in Serdang in March, April, May and June. The female is much rarer, and lacks on the upperside the splendid orange gloss on both wings. The silky "male-mark" of this species closely resembles that organ in *Biduanda cinesioides*, de Nicéville, No. 486 below.

479. HORAGA HALBA, Distant.

Originally described from Penang. It occurs from Selesseh to Bekantschan, and in the months of March, July and October. Very rare, as Dr. Martin has not obtained more than four specimens in thirteen years.

480. CATAPŒCILMA ELEGANS, Druce.

Grose Smith. Hagen. Common throughout the year over the whole of our area with the exception of the higher elevations, and found not only in forests, but also near roads, and settled on small bushes. Dr. Martin has never seen this butterfly on the wing in the morning, it appears very late in the day, at one or two o'clock P. M. The males are very fond of fighting, but return always with great exactitude to the leaf from which they started to do battle with the foe, which is usually another male of the same species.

481. SEMANGA SUPERBA, Druce.

HABITAT: Borneo (*Druce*); Malacca, Malay Peninsula (*Distant*); N.-E. Sumatra.

EXPANSE: ♂, 1·1 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* differ from those of the female only in having the purple area considerably larger, more shining and richer in shade. *Forewing* with the apex more acute and the outer margin more convex than in the female. *Hindwing* lacks the discal orange band of the female; the wing is also narrower and the outer margin straighter. UNDERSIDE, *both wings* as in the female.

Grose Smith. In Sumatra it occurs rarely in the Battak mountains and at Selesseh in July, August and October.

482. BIDUANDA THESMIA, Hewitson.

Grose Smith. Staudinger. Distant. Very common in the forests from the plains to the elevation of Bekantschan, and occurs all the year round. Both sexes rest on the buds of some moderately high shrub, with the head mostly downwards. It occurs exactly in the same localities and is quite as common as *Marmessus moorei*, Distant, which it greatly resembles. If one species mimics the other it would be difficult to say which is the model and which the one that copies it.

483. *BIDUANDA ESTELLA, Hewitson.

Hewitson. Grose Smith. Kirby. Both sexes originally described from Sumatra. As Hewitson does not mention any secondary sexual characters in the male, and the inner margin of the forewing as described and figured is straight instead of bowed outwardly, it is more than probable that it does not come into the genus *Biduanda*, as that genus possesses male secondary sexual characters, but in the absence of specimens I do not know where else to place it.

484. BIDUANDA SCÆVA, Hewitson.

Originally described from Singapore. In Sumatra it is found only in the mountains at higher elevations, where it flies throughout the year, as Dr. Martin possesses specimens from every month. It must be very common under favourable conditions, as one collector once brought in a consignment of sixty specimens. The female is very rare.

485. BIDUANDA NICEVILLEI, Doherty.

First discovered in Burma. Very rare in the Battak mountains, Dr. Martin possesses three females only taken in January, March and December. Dr. Martin thus describes his specimens, the female being hitherto unknown. "FEMALE. EXPANSE: 1·35 inches. UPPERSIDE, *forewing* brown, in the middle somewhat brighter, more reddish. *Cilia* dark brown. *Hindwing* with two subanal black spots, somewhat confluent, bordered inwardly by a large pure white area which occupies the posterior half of the wing; a fine anteciliary black line. *Cilia* white. *Tails* three, white. UNDERSIDE, *both wings* as in the *male*."

486. BIDUANDA CINESIOIDES, de Nicéville.

Originally described from the Malay Peninsula. Is not as rare as the foregoing species, but is much rarer than the two other *Biduandas.* Found in the Battak mountains in January, April, July and December. The male has a very conspicuous sexual mark on the upperside of the forewing.

487. MARMESSUS MOOREI, Distant.

Hagen. Staudinger. Distant. Snellen. One of the commonest lycænids of the forest of the plains and outer hills, and flies throughout the year. Superficially very similar to *Biduanda thesmia*, Hewitson, not only in coloration and form, but also in habits. Mr. Distant has figured on pl. xliv, fig. 11 of Rhop. Malay. a very small female of this species as a variety. Such dwarf forms in both sexes are not at all rare in Sumatra.

488. MARMESSUS BOISDUVALII, Moore.

Dr. Martin possesses a single pair which appertains to this species, as they have a large discal orange patch on the upperside of the forewing. They were taken in the Battak mountains in February.

489. *MARMESSUS RAVINDRA, Horsfield.

Hagen. Grose Smith. As this butterfly is found in Nias and Java, it not improbably occurs in south-eastern Sumatra also.

490. EOOXYLIDES THARIS, Hübner.

Grose Smith. Moderately common in the low forests at Selesseh and Namoe Oekor, and occurs throughout the year. It is rarer than *B. thesmia*, Hewitson, and *M. moorei*, Distant.

491. LOXURA ATYMNUS, Cramer.

Hagen.

492. LOXURA CASSIOPEIA, Distant.

Hagen. Originally described from Perak in the Malay Peninsula. Both the species of *Loxura* occur throughout the year at low elevations not much higher than Namoe Oekor in forest or its margins. They have a short and jerky flight, and are weak on the wing, never flying for long distances.

493. YASODA PITA, Horsfield.

Grose Smith. Hagen. Originally described from Java.

494. YASODA PITANE, de Nicéville.

Y. pitane, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. viii, p. 50, n. 10, pl. L, fig. 5, *male* (1893).

The female of this species still awaits discovery. Both species of *Yasoda* occur only at high elevations, *Y. pita*, Horsfield, in March, October and December at Soengei Batoe, *Y. pitane* only on the Central Plateau in March and August. Both are really and actually rare butterflies.

495. ARAOTES LAPITHIS, Moore.

Found from Selesseh to Bekantschan, and is moderately rare in forests from March to August. On the wing its habits are like those of *M. moorei*, Distant, and, as the white band on the underside of the forewing is not seen when resting with closed wings, is often taken for that common species, and thus escapes being captured.

496. SITHON NEDYMOND, Cramer.

Grose Smith as *nedymond* and *chitra*. Hagen as *nedymond* and *chitra*. Staudinger. Kirby. Distant. *S. nedymond* is the male and *S. chitra*, Horsfield, the female of one and the same species. Occurs over the whole of our area, as we possess specimens from Stabat, Selesseh, Namoe Oekor, and from the Battak mountains, taken from March to August, and October to December. In primeval forest on low bushes, mostly resting on the underside of leaves. *S. nedymond* and *S. chitra* are always taken at the same time and in the same localities, though we have never succeeded in getting them paired. The species is far less rare than it was formerly believed to be.

497. DEUDORIX EPIJARBAS, Moore.

Moderately rare in forests from Selesseh to Bekantschan, the female much rarer than the male. Males differ greatly in size, from 1·2 to 1·7 inches. Flies from March to August and again in December.

498. ZINASPA DISTORTA, de Nicéville.

A rare butterfly here as elsewhere, Dr. Martin has only four specimens, three males and one female, the latter captured in January, the former from June to August. Occurs from Namoe Oekor to Soengei Batoe.

499. RAPALA DELIOCHUS, Hewitson.

A very rare species. I caught a single male at Selesseh in October. Dr. Martin possesses a few of both sexes from Selesseh to Bekantschan taken in May, June, July and October. The males vary greatly in size, the smallest measures ·95 of an inch, the largest 1·35 inches. The markings and coloration of the underside remind one of those of *Lampides*, which is considered to be a protected genus, and may perhaps to some extent account for the scarceness of specimens of *R. deliochus* in collections, as they are passed over for the common species of *Lampides* which they may mimick.

500. RAPALA RHŒCUS, de Nicéville.

R. rhœcus, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. ix, p. 319, n. 35, pl. P, fig. 47, *male* (1895); idem, id., l.c., vol. x, p. , n. 27, pl. T, fig. 40, *female* (1896).

Taken at Bekantschan and in the Battak mountains, where this fine species is fairly common in May and July, rarer in March, April and October. The female on the upperside is somewhat marked with red on both wings, on the inner margin of the forewing, and near the anal angle of the hindwing, an unusual feature in this genus.

501. RAPALA SCHISTACEA, Moore.

A few specimens only from Selesseh taken in May and June.

502. RAPALA SCINTILLA, de Nicéville.

Hitherto known from Sikhim only. Its occurrence so far south is very interesting. It is quite a distinct species, which can always be discriminated in both sexes by the peculiar coloration of the underside alone, though as regards the male the restriction of the blue gloss to the upperside of the hindwing best distinguishes that sex. In Sumatra it is commoner than *R. schistacea*, Moore, and is found from Selesseh to Bekantschan from March to June.

503. RAPALA ORSEIS, Hewitson.

Hewitson. Grose Smith. Kirby. Distant. Originally described from Sumatra, certainly the commonest species of the genus, and found from Bindjei to Soengei Batoe throughout the year.

504. *RAPALA CHOZEBA, Hewitson.

Hewitson. Grose Smith as var. *chozeba*. Hagen as *Deudoryx* [sic] *chozeba*. Kirby. Originally described from Sumatra. We have failed to recognise it. It is very near to *R. orseis*, Hewitson.

505. RAPALA NISSA, Kollar.

Only two females taken in the Battak mountains in October, 1893.

506. **Rapala abnormis**, Elwes.

R. abnormis, Elwes, Proc. Zool. Soc. Lond., 1892, p. 642, pl. xliv, fig. 2, *male*.

Originally described from the Karen Hills, Burma. A very rare species with the underside quite uniquely marked. Three specimens from the Battak mountains in July.

507. **Rapala pheritima**, Hewitson.

Originally described from Borneo (Sarawak). It is recorded by Moore in Proc. Zool. Soc. Lond., 1883, p. 528, from Tounghoo in Burma, Singapore, and Sumatra, but not from Borneo, from whence the type came. Dr. Martin obtained a single pair in Indragiri in Eastern Sumatra in February.

508. **Rapala rhodopis**, de Nicéville.

R. rhodopis, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. x, p. , n. 28, pl. T, figs. 41, *male*; 42, *female* (1896).

Occurs rarely in the Battak mountains in March, May, July, August, and September, and again in December. Also one male taken at Selesseh.

509. **Rapala rhoda**, de Nicéville.

R. rhoda, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. x, p. , n. 29, pl. T, figs. 43, *male*; 44, *female* (1896).

Described from a single pair obtained in the Battak mountains in February.

510. **Rapala suffusa**, Moore.

Originally described from Burma, found also in Assam. Rare in Sumatra, Dr. Martin possesses only two females, and I three males and two females taken at low elevations.

511. ***Rapala melampus**, Cramer.

Snellen as *Deudoryx* [sic] *melampus*. Hagen as *Deudoryx* [sic] *melampus*. As Heer P. C. T. Snellen has recorded this species in two of his papers on the butterflies of Sumatra as well as Dr. Hagen, there can be no reasonable doubt that it occurs in the island, though we have not met with it.

512. **Rapala jarbas**, Fabricius.

Next to *R. orseis*, Hewitson, this is the commonest species of the genus in Sumatra at low elevations, not higher than Namoe Oekor.

Occurs not only in forest, but also in gardens and near houses. It often flies very late in the afternoon, Dr. Martin has taken it between 5 and 6 P. M.

513. RAPALA XENOPHON, Fabricius.

Distant. Much rarer than *R. jarbas*, Fabricius, and occurs at a higher elevation from Selesseh to Bekantschan. We have specimens taken in March, July, and December only.

514. RAPALA DOMITIA, Hewitson.

Grose Smith. Dr. Martin obtained a single female in November at Kepras. It is a most aberrantly-marked and coloured species.

515. BINDAHARA PHOCIDES, Fabricius.

Very rare in Sumatra, Dr. Martin in thirteen years having obtained only three males and one female in February, May, and July. Only from higher elevations in the Battak mountains. Distant's figure of the species (Rhop. Malay., pl. xx, fig. 25, *female*) is an exceptionally bad one. The males vary greatly in size, the smallest measuring 1·35, the largest 1·75 inches; Dr. Martin's only female taken in February measures 1·6 inches.

516. BINDAHARA SUGRIVA, Horsfield.

One male only, taken in the Battak mountains in July. It is on the underside of both wings very similar to the same sex of *B. phocides*, Fabricius, but it has on the upperside of the hindwing a blue band extending along the margin from the apex to the third median nervule, and increasing in breadth posteriorly. The occurrence of this species recorded from South India, Ceylon and Java, together with *B. phocides*, Fabricius, (which has no blue band in the male), recorded from Sikhim, Bhutan, Assam, Burma, the Andaman Isles, the Malay Peninsula, and Nias, in North-Eastern Sumatra is a very interesting fact. Mr. W. H. Miskin records *B. sugriva* from Cape York in North Australia, the Solomon Islands, and the Aru Islands, but in my opinion these specimens are probably not typical, but represent distinct local races.

517. *SINTHUSA NASAKA, Horsfield.

Grose Smith. Originally described from Java, so that it is quite possible it occurs also in Sumatra though we have not met with it, especially as it is found again in Northern India.

518. SINTHUSA AMBA, Kirby.

Originally described from Malacca, occurs also in Burma.

519. SINTHUSA MALIKA, Horsfield.

S. malika, de Nicéville, Journ. A. S. B., vol. lxiii, pt. 2, p. 43, n. 37, pl. v, figs. 18, *male*; 6, *female* (1894).

Snellen. Grose Smith. Kirby. This species and *S. amba*, Kirby, occur in the mountains rarely at higher elevations south of Bekantschan. Of *S. amba* Dr. Martin possesses specimens taken in April and May, and again in July and August, and *S. malika* in March and April, June and July, and October and December, so of the former there may be two, and of the latter three generations in the year.

Family PAPILIONIDÆ.

Subfamily PIERINÆ.

520. LEPTOSIA XIPHIA, Fabricius.

Snellen as *nina*. Wallace as *nina*. Hagen as *nina*. Distant. Very weak and slow on the wing, and behaves exactly as the European *Leptidia* (= *Leucophasia*) *sinapis*, Linnæus, does, flying near the ground and seldom settling. It has been well named "The Wandering Snowflake." Occurs in open places in forests or on their margins, from Selesseh to Bekantschan, rather rare than common, occurs all the year round except possibly in June, from which month Dr. Martin does not possess any specimens with dates.

521. *DELIAS NINUS, Wallace.

Hagen as *ninus* and *dione*. Staudinger as *dione*. Originally described from Mount Ophir, Malacca, Malay Peninsula. Dr. Hagen records it from the Karo mountains. We have not met with it. According to von Mitis (Iris, vol. vi, p. 100, n. 5 (1893), *D. aglaia*, Linnæus, is an older name for *D. dione*, Drury, that species however being confined to the Eastern Himalayas, Assam, Burma, and China. Von Mitis restricts *D. ninus* to the Malay Peninsula.

522. *DELIAS PARTHENOPE, Wallace.

Hagen. Mitis. Originally described from Singapore and Borneo. Not obtained by us. Dr. Hagen says it is found only on the alluvial plain near the sea, is the only butterfly of the mangrove forest, and is even sometimes observed at sea.

523. *DELIAS EGIALEA, Cramer.

Wallace. Snellen. Staudinger. Kirby. A Javan species, which may perhaps occur at the south-eastern end of Sumatra.

524. DELIAS TOBAHANA, Rogenhofer.

D. tobahana, Rogenhofer, Verh. zool.-bot. Gesellsch. Wien, vol. xlii, p. 571, n. 1 (1893); id., Mitis, Iris, vol. vi, p. 102, n. 13, pl. ii, fig. 1, *female* (end of January, 1893).

D. derceto, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. vii, p. 557, n. 12 (23rd April, 1893); idem, id., l. c., vol. viii, p. 52, n. 12, pl. L, fig. 4, *male* (1893).

Rogenhofer. Hagen. Originally described by Herr Rogenhofer and I from Sumatra. Found only on the Central Plateau in the Toba and Karo districts, where it is by no means common, and strange to say, the males rarer than the females. Dr. Martin has specimens taken only in March, May, June, July, and September. It is of very delicate structure, and seldom seen perfect.

525. DELIAS BELLADONNA, Fabricius.

Pieris chrysorrhœa, Vollenhoven, Mon. Piérides, p. 6, n. 3, pl. ii, fig. 4, *male* (1865).

Kirby as *chrysorrhœa* [sic]. I do not propose in this place to discuss the innumerable forms of this species which have been described and named, of which von Mitis enumerates seven "varieties" besides the type, and has omitted two others, *D. hearseyi* and *D. boyleæ*, both of Butler. To these names I have to add the "*Pieris*" *chrysorrhœa* of Vollenhoven, described from the mountains in the interior of Sumatra. This species does not appear to have ever been properly understood, even von Mitis in his recent Monograph of the genus does not put it in the same group as *D. belladonna*. The figure differs from our specimens of *D. belladonna* from the Battak mountains in having the white areas on the upperside of both wings, but especially of the hindwing, larger and more or less coalescing. The figure does not show the characteristic yellow spot at the base of the hindwing on the upperside owing to the way the specimen drawn was set, the costa of the hindwing being broadly covered over by the forewing. The non-perception of this spot is probably the cause that the species appears never to have been recognised until now, combined with the fact that *D. belladonna* in none of its forms was ever suspected to occur in the region of the equator. The vast stretch of country between Assam, the most southernly point hitherto known for *D. belladonna*, and Sumatra has however been partially bridged over by the discovery of the butterfly by Capt. E. Y. Watson in the Chin and Shan Hills of

Upper Burma, and by Colonel C. T. Bingham at the top of Mooleit mountain and at a lower elevation in the Daunat Range, both in Middle Tenasserim, Burma. The Burmese and Sumatran specimens in our collection quite agree, and would probably be called var. *amarantha*, Mitis, by the describer, who gives Darjiling as the habitat of that form. In Sumatra it is very rare, occurring only at Soengei Batoe and on the Central Plateau, Dr. Martin in thirteen years collecting only obtained ten specimens, of which seven were captured in June and July, and one each in January, March, and October. All these specimens shew but little variation in colouring and markings. The single female Dr. Martin possesses has the ground-colour slightly lighter than in the male, more brown than black, the spots on both wings are larger and more yellow, in the male they are whitish, and the anal area is pale yellow instead of dark yellow as in the male. Dr. Martin gives the expanse of his male specimens as 1·8 to 2·4, of the female 2·3 inches, hence they average somewhat less than specimens from the Eastern Himalayas. Since the above was in type I have seen Heer P. C. T. Snellen's note on this species in Tijd. voor Ent., vol. xxxviii, p. 26 (1895), in which he calls ***P. chrysorrhœa*** a small local variety of *P. belladonna*.

526. DELIAS GLAUCE, Butler.

Snellen as *belisama*. Hagen as *belisama*, and *belisama*, var. *glauce*. Wallace as *belisama*. Staudinger as *belisama*. Kirby as *belisama*. Grose Smith. The true *D. belisama* of Cramer, is, I believe, confined to Java, while *D. glauce* takes its place in Borneo and Sumatra. It is common on the Central Plateau round the Battak kampongs, where it frequents the red flowers of the "Datap" trees (*Erythrina indica*, Lam.), according to Dr. Hagen. Dr. Martin has obtained a few specimens also from Soengei Batoe and even from Bekantschan, where they may perhaps have been carried by one of the frequent heavy storms that occur in the mountains. The female is very melanic in its colouring, as the white areas on the upperside of both wings in the male are very greatly reduced in the female. It occurs most commonly from May to July, but it flies in every month in the year.

527. DELIAS HYPARETE, Linnæus.

Hagen. Wallace. Common over the whole of our area, even on the Central Plateau, mostly in orchards near houses, as the species of *Viscum* on which the larva feeds grows very frequently upon fruit-trees, especially on *Anonaceæ*. If flies throughout the year, but is most abundant in May. The larva is yellow and hairy; the pupa is dark yellow with deep shining black (as if varnished) spots. The males are very fond of flowers, on which they settle with closed wings like an *Euplœa*. It is almost certain that all the species of *Delias* feed in the larval state on *Viscum* and *Loranthus* which are found everywhere, and as there are species of *Loranthaceæ* occurring also on Rhizophores (Mangrove trees) on the sea beach, the strange fact which has been observed by Dr. Hagen that *D. parthenope*, Wallace, is the only butterfly found in the Mangrove forests, is explained.

528. DELIAS SINGHAPURA, Wallace.

Hagen. One female only obtained near Selesseh in June, 1894.

529. DELIAS DANALA, de Nicéville.

D. danala, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. viii, p. 51, n. 11, pl. L, fig. 9, *male* (1893).

D. karo, Hagen, Iris, vol. vii, p. 33, n. 61, pl. i, fig. 4, *male* (1894).

Hagen as *karo*.

530. DELIAS HAGENI, Rogenhofer.

D. hageni, Rogenhofer, Verh. zool.-bot. Gesellsch. Wien, vol. xlii, p. 572, n. 2, (end of January, 1893); id., Mitis, Iris, vol. vi, p. 113, n. 75, pl. iii, fig. 5, *male* (1893).

D. datames, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. vii, p. 557, n. 10 (23rd April, 1893); idem, id., l. c., vol. viii, p. 53, n. 13, pl. L, fig. 8, *male* (1893).

D. simanabum, Hagen, Iris, vol. vii, p. 34, n. 63, pl. i, fig. 3, *female* (1894).

Hagen as *hageni* and *simanabum*. Both *D. hageni* and *D. danala*, de Nicéville, occur only at the elevation of Soengei Batoe and on the Central Plateau; they are most numerous from June to August, during the other months of the year but few specimens have been obtained.

531. PRIONERIS CLEMANTHE, Doubleday.

Hagen. Rare in our area, a few specimens only from near Selesseh including one of the excessively rare females. Like *Hebomoia borneënsis*, Wallace, it is more common on our western boundary, as the Gayoe collectors have brought in males in large numbers. Flies from January to June, but is most abundant in February.

532. PRIONERIS HYPSIPYLE, Weymer.

P. hypsipyle, Weymer, Stet. Ent. Zeit., vol. xlviii, p. 12, n. 10, pl. i, fig. 1, *male* (1887).

Hagen as *hypsypule* [sic]. My female differs from the male only in the forewing being blunter, less produced at the apex. Dr. Martin and I have obtained a single example each of this sex. The male is somewhat variable, in some specimens more than half the discoidal cell on the underside of the hindwing is black, with a very small basal vermilion patch, while in others there is no black coloration in the cell at all, and the vermilion patch is very large. Intermediate examples occur between these two extremes. Both sexes are quite distinct from the Javan *P. autothisbe*, Hübner. The males are very common, quite as common as are *Hiposcritia pandione*, Hübner, and *H. cardena*, Hewitson, all through the year at Soengei Batoe and on the Central Plateau, where in every month hundreds of males are brought in by the collectors. Both sexes mimic *Delias glauce*, Butler. Dr. Martin thus describes his female example, which was taken in March, 1893:—"Mimics the same sex of *D. glauce*, Butler. The outline of the forewing is quite rounded like that of a *Delias*, and the costa of course is not serrated. The base of the costa of the forewing on the upperside has two minute sulphur-yellow streaks which in the male are black. The upperside of the forewing has a more bluish and the hindwing a more reddish and transparent colour than in the male. The white spots at the apex and on the outer margin of the forewing both above and below are very much reduced, the inner series entirely wanting except the anteriormost spot, the outer series consisting of five spots, in the male there are six, which are indistinct, obsolete, and whitish. The underside of both wings is duller than in the male."

533. CATOPSILIA CROCALE, Cramer.

Hagen as *crocale* (1775), *catilla* (1779), and *pomona* (1775). Wallace as *alcmeone*, Cramer (1777). Grose Smith. Butler. Distant. This is the largest and commonest species of *Catopsilia* occurring in Sumatra. Most authors retain *C. catilla*, Cramer, as a species distinct from *C. crocale*. I have bred both species from found larvæ (not from the egg laid by a known female in confinement, which is practically the only conclusive test of the distinctness of species), and have failed to discover any differences in the larva and pupa of the two supposed distinct species. My opinion is that *C. crocale* is extremely variable, and that the variations noted are not due to seasonal causes. Dr. Martin does not agree with me that we have here to deal with one protean species, but maintains that there are really two quite distinct species. At his request I give below his reasons for this conclusion. I may add that I have carefully examined a very large mass of material in the collection of the Indian Museum, Calcutta, and my own, and find that the distinctive characters on which Dr. Martin relies to separate them are all quite inconstant and entirely break down, the black antennæ of *C. crocale* being sometimes found with the ocellated underside of *C. catilla*, and *vice versa*. The restriction of the yellow coloration of the upperside of both wings of the male to the basal area, or its equal diffusion over the whole surface, correlated with the presence or absence of the ocelli on the underside, is also quite an unstable feature by which to distinguish the two species. Dr. Martin writes:—

"I am quite unable to follow Mr. de Nicéville in his amalgamation of *C. crocale* and *C. catilla*, and am forced to keep them separate for the following reasons:—

"*C. crocale*, the far commoner species, occurs in Sumatra on roads, near houses and gardens, and is never found in the forest. It sometimes appears in large numbers, in which case the larvæ are very destructive, as in January, 1893, near the Poengei Estate, five kilometers north of Bindjei, they destroyed in a short time a fine plantation of young iron-wood trees, *Cassia florida*, Vahl., valued at least at $ 3,000, by eating up all the leaves and suffocating the plants. All the grass and every low shrub near this murdered plantation was covered with the pupæ, and after the butterflies had emerged, the whole place looked as if there was a heavy snow-storm in progress, the air being full of large flakes of snow. I took there many hundreds of specimens of both sexes, but amongst them was not a single *C. catilla*. This seems to me to be an abundantly conclusive fact. The antennæ of *C. crocale* are black in both sexes, and the males have the underside of both wings simply yellow and white of a washed-out shade. The tuft of hair on the inner margin of the forewing is whitish. There are two forms of the female of *C. crocale*:—I, the form figured by Distant in Rhopalocera Malayana, pl. xxv, fig. 12, without any yellow colour near the base of both wings on the upperside; Sumatran specimens are even somewhat darker than Distant's figure, and show on the upperside of the hindwing four or five submarginal black lunules, this form being the rarer one. II, the commoner form is brighter, not so black as the first form, the basal half of the upperside of both wings is nearly as yellow as in the male, the black markings on the costa, apex, at the end of the discoidal cell, and the outer margin of the forewing on the upperside are sharper defined. *C. crocale* is enormously common, and occurs throughout the year; the males are fond of flowers, and especially of the *Hibiscus rosa-sinensis*, Linnæus, to the deep crimson cups of which they present a beautiful contrast when settled. The larva feeds on the leaves of the above-mentioned *Cassia florida*, and sometimes in company with *Catopsilia pyranthe*, Linnæus, on *Cassia alata*, Linnæus, and is of a yellowish-green or yellowish-brown colour, with a lateral blackish-brown streak. The pupa, suspended by a white median girth, is green with a yellow lateral streak and a very pointed head."

"*C. catilla* is found only in the forest, the males on forest roads on wet spots together with *Lycænidæ* and *Papilioninæ*, but they form the larger number of such congregations, and often occur in such large crowds that dog-cart horses get frightened on approaching one of these white spots on the road, which all at once flutters up into the air with an audible sound. If driven away from these favourite spots, they fly rapidly in Indian file up and down the forest roads, and fall in again on the same spot when the danger is passed. *C. catilla* appears never to be a destructive insect as is *C. crocale* at times. The antennæ in both sexes are distinctly red. The male has on the underside of both wings at the termination of the discoidal cell some red spots, one in the forewing, two in the hindwing, the latter with silvery centres. The sexual tuft of hair is of a darker shade of yellow than in *C. crocale*, and the whole colouring of the underside is of a dull, silky, or leather-like gloss. There is also on the underside of the forewing a somewhat obscure reddish band, commencing near the apex of the wing, and extending towards the middle of the inner margin, ending on the second median nervule. *C. catilla* also has two forms of female:—I, the form figured by Distant on pl. xxv, fig. 15, which exhibits numerous varieties as regards the extent of the reddish-brown colour on the underside of both wings, there being all gradations from specimens with very little red to quite dark ones. II, the second form is on the upperside of both wings pale sulphur-yellow, and not dark yellow as in the first form, and the costal and marginal black spots on the upperside of both wings are not so distinct; on the underside there is never any reddish-brown colouring. This form is the rarer, I have always obtained one of it to five of the other. I am entirely ignorant of the larva, pupa, and food-plant of *C. catilla*; but as the larval stages of the two other *Catopsilias* occurring in Sumatra, *C. pyranthe*, Linnæus, and *C. scylla*, Linnæus, which I know very well, differ only slightly from those of *C. crocale*, it may be anticipated that the early stages of *C. catilla* also possess the same characteristics. *C. crocale*, *C. pyranthe*, and *C. scylla* I have bred on different species of *Cassia*, so also *C. catilla* will probably be found some day in the larval stage feeding on a *Cassia* growing in the forest."

534. CATOPSILIA PYRANTHE, Linnæus.

Grose Smith. Snellen. Wallace. Hagen as *pyranthe*, *philippina* and *chryseis*. Distant as *chryseis*. The form of this species found in Sumatra has in both sexes on the upperside of the forewing a broad outer black margin, this form being the *C. chryseis* of Drury. It is quite typical throughout the Malay Peninsula, but when it reaches the latitude of Burma it gradually merges into typical *C. pyranthe*, which latter is found all over India and Ceylon. It is not seasonally dimorphic in Sumatra as it is in India. In our area it is found only at low elevations, not higher than Namoe Oekor, where it is local owing to the presence or absence of *Cassia alata*, Linnæus, the food-plant of its larva. As this tree is very partial to swampy ground, and even grows in swamps with brackish water, *C. pyranthe* occurs very near the sea, and flies all the year round. It has only one form of female, but it is variable, some specimens being much more melanic than others. The larva is quite green, without the lateral brown streak of *C. crocale*, Cramer. The pupa has a blunt rounded head, not a pointed one as in *C. crocale.*

535. CATOPSILIA SCYLLA, Linnæus.

Snellen. Grose Smith. Hagen. Kirby. Distant. Wallace. Dr. B. Hagen informed Dr. Martin that this species was not at all rare near Medan, the capital of the Deli district, from 1879 to 1882. Dr. Martin had never seen it in the plains, and had received a few specimens only from the Central Plateau from Battak collectors. In Penang and Singapore on the mainland of Asia it is always very common in gardens. So Dr. Martin would hardly believe Dr. Hagen that *C. scylla* belonged to the fauna of the plains of Sumatra, especially as Dr. Martin never saw or obtained any specimens from 1882 to 1894. Suddenly in August and September of the latter year, after nearly twelve years interval, *C. scylla* appeared everywhere in Deli and Langkat in suitable places such as gardens and fallow-land near houses where *Cassia sophera*, Linnæus, the food-plant of the larva, grows. Since then *C. scylla* belongs to our fauna, although it is the rarest of all our *Catopsilias*, and we would call attention to the interesting fact that a butterfly has disappeared for twelve years from a spot in every way apparently suitable for its existence, and has again reinstated itself by immigration from the south-west (the Battak and Gayoe mountains) or from the east (the Malay Peninsula over the shallow Straits of Malacca). The larva is dark velvety-green, with a yellowish-white lateral streak, and some very minute black spots on each segment anterior to the streak, the whole surface delicately ringed or indented like a leech. The pupa has a pointed head like that of *C. crocale*, Cramer, but is shorter and more convex than the slender pupa of that species.

536. Udaiana cynis, Hewitson.

Pieris cynis, Hewitson, Ex. Butt., vol. iii, pl. *Pieris* viii, fig. 54, *male* (1866).
Udaiana pryeri, Distant, Rhop. Malay., p. 301 (1885).
Udaiana androides, Hagen, Iris, vol. vii, p. 32 (1894).

Hewitson. Wallace. Butler. Kirby. Distant. Hagen as *cynis* and *androides*. Originally described from Sumatra. I have a large series of both sexes of this species in my collection from three distinct localities, the Malay Peninsula, Sumatra and Borneo. In all of these they present exactly similar and parallel variations. The males have the underside of the hindwing (1) entirely pure white, (2) with the base sprinkled with greenish-fuscous scales, (3) with the base heavily marked with a broad black band, beyond which, crossing the disc of the wing but not reaching the costa or abdominal margin, is a fuscous rather broad line or fascia, and every gradation exists between these three forms. The latter form is the *U. pryeri* of Distant, described from North Borneo. The females vary greatly in the extent of the development of the fuscous coloration on the upperside of both wings, in the palest form, which has been named *U. androides* by Hagen, this is hardly more extensive than in the male, while every gradation exists until the darkest form figured by Distant in Rhop. Malay., pl. xxvi, fig. 6, is reached. In the case of *U. cynis*, *U. pryeri*, and *U. androides* I am sure we have to do with one protean species only. In this Dr. Martin entirely agrees with me for the reason that he has caught all three forms at the same time in the forest near Selesseh. *U. cynis* is found exclusively in the forest and throughout the year, but only at low elevations not higher than Namoe Oekor. The males sometimes come to wet spots on roads together with *Catopsilia catilla*, Cramer, and species of *Terias*; the females are captured on the green flowers of a low creeper in the forest. *U. cynis* never occurs in the black-soil-forests of Deli, but as soon as the red-soil-forests of Langkat and Serdang are entered there it appears at once.

537. Terias harina, Horsfield.

Hagen. Wallace. This is the true *Terias* of the forest, where it is found somewhat rarely frequenting flowers together with species of *Zemeros* and females of *Lycænidæ*. It is found throughout our area, with perhaps the exception of the Central Plateau, and flies throughout the year.

538. Terias libythea, Fabricius.

Snellen as *brigitta*. Hagen as *brigitta*, var. *drona*, and *drona*. The "*Papilio*" *brigitta* of Cramer was described from "La Côte de Guinée."

It is treated by Trimen as a purely African butterfly. The original figure does not at all agree with the original figure of *T. drona*, Horsfield = *T. libythea*, Fabricius, as it has no black border to the hindwing on the upperside. Watson in Journ. Bomb. Nat. Hist. Soc., vol. viii, p. 515 (1894) says that *T. drona* as identified in the British Museum has the "marginal band of hindwing evenly narrow throughout." This is incorrect, as a glance at the original figure will show, at the costa it is broad, fining away to nothing at the anal angle. Butler states in Ann. and Mag. of Nat. Hist., fifth series, vol. xvii, p. 221 (1886) that the unique specimen described by Horsfield is a female. I doubt this, I should say it was a male, as it is clear yellow on the upperside; were it a female it would have a heavy sprinkling throughout of black dots. It therefore agrees in this character with *T. libythea*, which is defined by Watson as having the "marginal band of hindwing broad at apex and narrow at anal angle." Butler in Cat. Fab. Lep. B. M., p. 227, says that *T. libythea* is "an unspotted variety of Horsfield's *T. drona*." From a careful examination of my series of *Terias* of this group, it appears to me that *T. libythea* (following the identification of this species in the British Museum) is the dry-season form, with *T. rubella*, Wallace, as a synonym, and *T. drona* the wet-season form, with *T. senna*, Felder, as a synonym, of one and the same species. The wet-season form (*T. drona*) alone occurs in Sumatra. In Sumatra it is found only on the Central Plateau of Tobah and Karo, and even there is not very numerous and occurs only at certain times. Though the collectors were instructed always to catch this species when they could, they only brought in specimens in December and January, when it appears to be common, and in May and July, when it appears to be rare, and not a single one in any other month, so the species in Sumatra would appear to be double-brooded.

539. TERIAS TILAHA, Horsfield.

Hagen. Sumatran specimens have a reniform mark at the end, and a W-shaped mark at the middle of the discoidal cell of the forewing on the underside. The female is paler on both surfaces than the male, of a lighter more gamboge-yellow colour, with the marginal band on the upperside of the hindwing twice as broad, narrow at the apex, very broad at the anal angle, and extending on to the disc on either side of the submedian nervure. It is the rarest *Terias* of our area, found throughout the year on the outer mountains and also in the plains, as several specimens have been obtained at Selesseh, though Dr. Hagen says that it is not found below an elevation of 500 feet. In 1887 Dr. Martin took a specimen at the Terdjoen Estate very near the sea. It must be more common in the Gayoe-lands, as the Gayoe collectors always brought it in largely.

540. TERIAS SARI, Horsfield.

Wallace. Distant. This species is well figured by Distant, and by Snellen in Midden-Sumatra, Lepidoptera, pl. i, figs. 8, 9, *male* (1892), as *T. hecabe*, Linnæus, var. two. The Sumatran is absolutely identical with the Indian form. Both sexes have a double line at the end and a small linear marking at the middle of the discoidal cell of the forewing on the underside. The female is of a paler yellow colour than the male, with the marginal band on the upperside of the hindwing twice as broad throughout its length, posteriorly inwardly diffused and powdery. *T. sodalis*, Moore, described from the Mergui Archipelago in Lower Burma, the types of which are in the Indian Museum, Calcutta, is a synonym of *T. sari*. Moore says his species is smaller than *T. sari*, but we have Sumatran specimens quite as small, but the marginal band on the upperside of the hindwing in both sexes is certainly somewhat narrower in both sexes of *T. sodalis* than in *T. sari*, but this very poor character is not in my opinion sufficient to separate the two specifically.

541. TERIAS TOBA, de Nicéville, n. sp.

HABITAT: N.-E. Sumatra.

EXPANSE: ♂, 1·2 and 1·6; ♀, 1·6 inches.

DESCRIPTION: This species has been well figured by Snellen in Midden-Sumatra, Lepidoptera, pl. i, figs. 10, 11, *female* (1892), as *T. hecabe*, Linnæus, var. one. It appears to be allied to *T. sari*, Horsfield, and has in both sexes a double line at the end, and two (instead of one) small markings towards the base of the discoidal cell. Like *T. sari*, it has the cilia of both wings black. It differs, markedly, however, from that species in its much smaller size; its very pale primrose colour (*T. sari* is dark yellow); in the very large apical brown patch on the underside of the forewing of *T. sari* reduced to a small linear brown band, and the oblique brown marking at the outer angle of *T. sari* altogether absent. The "male-mark" in this form is short, broad, and very prominent. The female is even paler yellow than the male, being almost as white as in the same sex of *T. harina*, Horsfield. The marginal band on the upperside of the hindwing is twice as broad as it is in the male, being of the same width as in the male of *T. tilaha*, Horsfield. It is possible that the male of *T. toba* has been figured by Distant in Rhop. Malay., pl. xxvi, fig. 13, *male*, as *T. senna*, Felder. True *T. senna* (see No. 538 above) belongs to quite a different group, *T. toba* being of the *hecabe* group. Described from two males and one female.

542. TERIAS ANDERSONII, Moore.

This also appears to be allied to *T. sari*, Horsfield, the males are the same size, the "male-mark" is the same, not as in the preceding species, it agrees with *T. sari* also in the markings of the discoidal cell of the forewing on the underside; differing, however, in its paler colour, though it is not as pale as the preceding species; in having on the underside of the forewing either no apical brown patch or a very small linear one, and no oblique brown marking at the outer angle as *T. sari* has. The cilia is black as in *T. sari*. It differs only from the types of *T. andersonii* now before me in its usually rather larger size and somewhat paler coloration on both surfaces. One specimen agrees in all respects with Distant's figure of *T. senna*, Felder, Rhop. Malay., pl. xxv, fig. 14, *female*, in having the markings of the underside entirely obliterated.

543. TERIAS HECABE, Linnæus.

Hagen. Snellen. Grose Smith. Wallace. Distant. This species has been well figured by Snellen in Midden-Sumatra, Lepidoptera, pl. i, figs. 6, 7 *male* [*nec* female] type (1892), see his Index to the Plates, p. 85. According to Capt. E. Y. Watson (Journ. Bomb. Nat. Hist. Soc., vol. viii, p. 509 (1894), *T. hecabe* may be known by never having "More than two streaks or spots in the discoidal cell on the underside of the forewing in addition to the reniform spot on the disco-cellular nervules." He has identified for me from Sumatra both the rainy-season form (true *T. hecabe* and *T. hecabeoides*, Ménétriès), which has "No apical brown patch on the underside of the forewing," and the dry-season form (*T. excavata*, Moore), which has at the "Apex of the forewing on the underside a more or less strongly pronounced brown patch." Seasonal forms in Sumatra, are, I believe, quite unknown, so perhaps, as in the case of *Melanitis ismene*, Cramer, the two forms, dry and wet, which are seasonal in India, occur together and without any reference to the dryness or humidity of the atmosphere in Sumatra. *T. hecabe* is numerically by far the commonest species of the genus in Sumatra, and Capt. Watson has kindly identified six different varieties of it for me, some of which he names *T. hecabeoides*, Ménétriès, *T. excavata*, Moore, *T. swinhoei*, Butler, *T. patruelis*, Moore, and *T. merguiana*, Moore. It would, I think, serve no useful purpose in our at present very superficial and inadequate knowledge of the genus as represented in the Malay Archipelago to define precisely all these varietal forms, some of which may perhaps be distinct species. It remains for a local observer to breed them carefully in large numbers from eggs laid in captivity, so as to ascertain if these varieties are seasonal forms, true species, or individual variations only. Dr. Wallace notes that "The varieties of this species are infinite over its extensive range, and cannot be profitably separated."

544. TERIAS SILHETANA, Wallace.

This species has been figured by Snellen in Midden-Sumatra, Lepidoptera, pl. ii, figs. 12, 13, *male* (1892) as *T. hecabe*, Linnæus. var. three. It seems to be rare in Sumatra, we possess but very few specimens. It may be known by having three dark streaks or spots (*T. hecabe*, Linnæus, has never more than two) in the discoidal cell of the forewing on the underside in addition to the reniform spot on the disco-cellular nervules. All our specimens are of the rainy-season form, which has the apex of the forewing on the underside unmarked with brown.

545. TERIAS TECMESSA, de Nicéville, n. sp.

Terias sari, Horsfield, var. *a*, Distant, Rhop. Malay., p. 305, n. 3, pl. xxvi, fig. 3, *male* (1885).

HABITAT: Penang, Malay Peninsula; N.-E. Sumatra.

EXPANSE: ♂, 2·1 inches.

DESCRIPTION: MALE. Of large size and rich dark yellow coloration on both surfaces. UPPERSIDE, forewing exactly as in Sumatran specimens of *T. sari*, Horsfield. *Hindwing* with the black margin broad, but a little variable in breadth, its inner edge festooned between the veins, dying away to nothing at the anal angle, the black border of about the same width as in *T. sari*. UNDERSIDE, *forewing* with a W-shaped brown marking near the base of the discoidal cell, a prominent zigzaged one across its middle, and a prominent double linear one at its outer end; a large brown apical patch as in *T. sari*, but always bearing outwardly some suffused spots of the yellow ground-colour. *Hindwing* marked as in *T. sari*, but the brown markings rather more prominent. *Cilia* of both wings black throughout.

The large apical brown patch on the underside of the forewing will at once separate it from all the named forms of *T. hecabe*, Linnæus, known to me, but the patch is precisely similar to that found in India in one of the dry-season forms of *T. silhetana*, Wallace, that species, however, having four instead of three disco-cellular markings; while the presence of two markings in the discoidal cell besides the disco-cellular one will distinguish it from *T. sari*.

Described from six males from N.-E. Sumatra and one from Penang. The female is unknown.

546. ***Terias eumide**, Felder.

Grose Smith. Originally described from Celebes. Wallace gives North Celebes and the Sula Islands as its habitat, with a "var." from Batchian. We have seen nothing like it from Sumatra.

547. ***Terias latilimbata**, Butler.

T. latilimbata, Butler, Ann. and Mag. of Nat. Hist., fifth series, vol. xvii, p. 221, pl. v, fig. 5 (1886).

Both sexes originally described from Sumatra.

548. ***Terias bidens**, Butler.

T. bidens, Butler, Ann. and Mag. of Nat. Hist., fifth series, vol. xvii, p. 222, pl. v, fig. 7, *female* (1886).

Originally described from Sumatra from a female.

549. ***Terias semifusca**, Butler.

T. semifusca, Butler, Ann. and Mag. of Nat. Hist., fifth series, vol. xvii, p. 222, pl. v, fig. 8, *female* (1886).

Originally described from Sumatra from a female. We are unable to recognise any of these species of Mr. Butler's.

All *Terias* are weak on the wing, fly slowly, and never leave the ground for a high flight. They are all, with the exception of *T. harina*, Horsfield, found in open places, in gardens, on roads, and near houses, the males frequently assembling in large numbers on wet spots on roads and by the sides of rivers and streams. *T. hecabe*, Linnæus, sometimes appears in swarms, and its larva may then prove very destructive to *Cassia* plantations. *Cassia florida*, Linnæus, is its favourite food-plant, on which the eggs are sometimes deposited singly as are the eggs of the *Catopsilias*, but sometimes on a single leaf a large number are placed in a rhomboid shape. In the latter case the green pilose larva with a yellowish-white lateral streak and a black head (all the larvæ of *Catopsilias* have a head concolorous with the body) live in societies, and the pupa are also suspended sociably, a fact not previously we believe observed in *Lepidoptera*. If the pupa hang from leaves they are green, if near the flowers of the *Cassia* they are yellow, and if the caterpillars leave the food-plant and pupate on certain high *Gramineæ* they are blackish-brown like the seed of the grass. As the pupæ are arranged at regular distances apart, the deception is a very good one and must greatly protect them, as men, animals and birds at a superficial glance would take these pupæ to be only withered flowers of the *Cassia* or ripe seeds of the grass. After six days in the pupa state the imago emerges. Though so weak and slow in flight, they are very clever in avoiding being caught by the net.

550. DERCAS GOBRIAS, Hewitson.

Grose Smith. Wallace. Staudinger. Kirby. Distant. Hagen. Is rather rare, and occurs from Bekantschan to the Central Plateau. Collectors never bring in more than two or three specimens at one time. We have specimens caught from February to August only.

551. IXIAS LUDEKINGII, Vollenhoven.

Hagen. Wallace. Kirby. Originally described from a male from the mountainous country in the interior of Sumatra. It is very rare, Dr. Martin has only two males taken in January of the last year of his residence in Sumatra, one caught in the Battak mountains at a high elevation, the other taken near Bohorok near the western boundary of our area, where also Dr. Dohrn's collector obtained several males.

552. IXIAS FLAVIPENNIS, Grose Smith.

I. flavipennis, Grose Smith, Nat. Wand. in the East. Arch., p. 275 (1885); id., Grose Smith and Kirby, Rhop. Ex., p. 2, n. 3, pl. *Ixias* i, figs. 6, 7, *male* [*nec female*] (1888); id., Weymer, Stet. Ent. Zeit., vol. liii, p. 121 (1892).

Thestias flavipennis, Snellen, Tijd. voor. Ent., vol. xxxiv, p. 335, pl. xvi, figs. 1, 2, *male*; 3, 4, *female* (1892).

Ixias pyritis, Weymer, Stet. Ent. Zeit., vol. xlviii, p. 13, n. 11, pl. i, fig. 4, *male* (1887).

Hagen. Snellen. Originally described from Sumatra where it alone occurs and only at high elevations, from Soengei Batoe to the Central Plateau, and the males are very common on the sandy banks of little streams; the females, very rare and taken in the forest only, come to hand in the proportion of one to a hundred males. They probably escape capture by the collectors owing to their white colour, being mistaken for the common species of *Catophaga* and *Hiposcritia*. Occurs throughout the year, Dr. Martin has specimens taken in every month. Both Drs. Martin and Hagen have obtained it from the Gayoe- and Alas-lands, where the butterfly possibly occurs at a lower elevation than in the Battak mountains.

553. CATOPHAGA NERO, Fabricius.

Grose Smith. Snellen. Hagen. Wallace. Staudinger. Semper. A very variable species in both sexes. Males from Sumatra have the ground-colour on the upperside of both wings "golden-yellow" (*Appias* *figulina*, Butler), rich orange, or deep crimson, with an equally inconstant development of the black markings along the veins, and of the discal fascia. The females also shew somewhat similar variations. Males are not rare in large forest, and frequent wet spots on roads. Females are very rare, Dr. Martin has only four specimens. It is found throughout the year and over the whole of our area except at the higher elevations; even occurs near the sea, Dr. Martin having taken it at the Saentis Estate. It flies very rapidly if pursued. The *A. nebo*, Grose Smith and Kirby, Rhop. Ex., pl. *Appias* i, figs. 1, 2, *male* (1894) described from Upper Burma, and of which I possess both sexes from the same locality taken in April, is I believe only a spring dry-season form of *C. nero*. Other synonyms of this species appear to be *Tachyris galba*, Wallace, described from N. India; *Pieris domitia*, Felder, described from Luzon; *Pieris zamboanga*, Felder, described from Mindanao; *Pieris asterope*, Felder, described from Luzon; *Appias mindanensis*, Butler, from Mindanao; and perhaps the *Tachyris nero*, var. *palawanica*, Staudinger, described from Palawan, is hardly separable.

554. CATOPHAGA HIPPO, Cramer.

Grose Smith as *enarete* and *lyncida*. Hagen as *lyncida* and *hippo*. Wallace. Staudinger as *lyncida*, var. *hippo*. Distant as *enarete*, var. *C. lyncida* was described and figured by Cramer from a male specimen, the habitat given being "Surinam," which, as in nearly all similar cases, was probably a *lapsus calami* for Sumatra. *C. hippo*, Cramer, was figured and described from a female specimen, the habitat given is "The west coast of Sumatra." These two names may perhaps represent opposite sexes of one and the same species; but as Wallace says that "*Tachyris*" *hippo* "Is distinguished from its allies ["*Papilio*" *lyncida*, &c.] by the clear ochre-yellow colour of the under surface of the lower wings in both sexes," I have used *C. hippo* for the species, though *C. lyncida* is the older. The latter name applies to the Javan form, which has the ground-colour of the underside of the hindwing entirely white. The *C. enarete* of Boisduval was described from the "Moluccas," probably in error, and is recorded by Dr. Wallace from Borneo, and may perhaps be kept distinct from *C. hippo*, as it has the outer black margin to the hindwing on the underside in the male broader than in that species. *C. hippo* in Sumatra is a constant species, and does not exhibit the great seasonal dimorphism which is found in the Indian forms. It is much commoner than *C. nero*, Fabricius, and the females are not very rare. It is found throughout the year, but only in or near the forest. The males often assemble twenty or thirty together on a small puddle on the road, the female is found in the forest hunting for flowers for herself, or for the food-plant of her larva. Dr. Martin has often seen them on the same flower that is frequented by the female of *Udaiana cynis*, Hewitson. He has bred the butterfly from the larva found feeding on a small shrub called by the Battaks "Daoen Tangla," which grows on the banks of rivers. The larva superficially does not greatly differ from the larvæ of the *Catopsilias*, but in shape is more slender. The pupa, however, is quite different, with a stellar indented thorax. The imago emerges in seven days. Only bred females have the beautiful olive-green colouring; almost as soon as they fly, this colour is bleached out. *C. hippo* occurs all over our area, and is one of our most common butterflies.

555. CATOPHAGA LEIS, Hübner.

Hagen as *amasene* and *leis*. Distant. Wallace as *alope*. Grose Smith as *alope*. I follow Mr. Distant in his identification of this species, not having Hübner's Zutraege Ex. Schmett. to consult; also in considering *C. alope*, Wallace, from India, Sumatra, Java, and Borneo, to be a synonym. *C. amasene*, Cramer, described from China, is superficially like the male of *C. leis*, and probably Dr. Hagen identified this species under that name. Semper identifies *C. leis* as "*Appias*" *agave*, Felder, from the Philippines. In Sumatra *C. leis* is restricted to the plains, and is only found in forest throughout the year. The female is very rare; the male comes to damp spots on forest roads as does *Catopsilia crocale*, Cramer, and many other *Pierinæ*. Common near Paya Bakong, the small forest reserve mentioned in the Introduction (page 359). Distant has well figured the male and two forms of the female from the Malay Peninsula.

556. CATOPHAGA PAULINA, Cramer.

Grose Smith as *albina* and *paulina*. Hagen as *paulina* and *albina*. Semper identifies this species from the Philippines as "*Appias*" *albina*, Boisduval. The male of *C. paulina* from Sumatra exhibits the same variations as it does in India, some specimens on the upperside of the forewing having a marginal black thread only, others have the apex widely, the outer margin decreasingly to the outer angle, powdered with black scales, while there is found every gradation between these two extremes. There are three distinct forms of female, the first and second are white on the upperside of both wings, the third is dark primrose-yellow-coloured; on the underside of both wings the first is of "A glossy tint of pearly-white" as Wallace well expresses it, the second has the apex of the forewing and the entire hindwing rich ochreous, the third has these areas of a different shade, ochreous diluted with pearly-white, the discal area of the forewing primrose-yellow, with a broad dark gamboge-yellow area occupying the basal two-thirds of the discoidal cell. Dr. Martin thinks that *C. leis*, Hübner, and *C. paulina* may be one and the same species. I keep them distinct as I can from my Sumatran specimens separate them easily into two species in both sexes. The male of *C. leis* has on the upperside of the forewing an inner apical broad black band (*vide* Distant's figure) which is quite wanting in *C. paulina*; the female of *C. leis* has the base of the forewing on the upperside more broadly black especially at the inner margin than in *C. paulina*, the base of the hindwing also black, in *C. paulina* it is white, on the underside of the hindwing in *C. leis* there is a submarginal series of suffused dark spots and the margin itself is also blackish, while in *C. paulina* the hindwing is concolorous throughout. In spite however of these apparently good differences it is quite possible that specimens intergrading between the two species may exist in Sumatra as they certainly do in India. It is an insect of the alluvial plain and occurs in the forests, the males on roads with *C. leis*, Hübner, the females rarer and within the forest. It flies throughout the year, and is common at Paya Bakong and near Selesseh, not found higher than Bekantschan.

557. HIPOSCRITIA PANDIONE, Hübner.

Hagen. Staudinger. Grose Smith as *lelage* [sic]. The *H. lalage* of Doubleday, from the Himalayas, Assam, and Burma, is quite distinct from the present species. Males of *H. pandione* are very common at high elevations from Soengei Batoe to the Central Plateau. The Battak collectors often brought in hundreds of males, but never a female. Occurs throughout the year, as we have specimens caught in every month. Of late the Battaks received orders not to catch any more specimens.

558. HIPOSCRITIA LEPTIS, Felder.

Staudinger. Distant as *leptis*, var. *plana*. Hagen as *leptis*, var. *plana*. The *Appias plana* of Butler was described from Malacca and Borneo, and cannot be retained as distinct from the present somewhat variable species. *H. leptis* is rather rarer than *H. pandione*, Hübner, and occurs throughout the year occasionally near Selesseh but commonly at Bekantschan. The female is very rare, Dr. Martin possesses three only, which present quite distinct indications of an obscure submarginal fascia on the underside of the hindwing, which, however, is absent in three females from Sumatra and one from Java in my collection.

559. HIPOSCRITIA CARDENA, Hewitson.

Grose Smith. Snellen. Wallace. Distant. Hagen. Quite as common as *H. pandione*, Hübner, and occurs in the same localities throughout the year. No female obtained.

560. SALETARA NATHALIA, Felder.

Grose Smith. Snellen as *panda*. Hagen. Wallace. Distant as *nathalia* and *panda*. Mr. Distant records both *S. panda*, Godart, and *S. nathalia* from the Malay Peninsula and Sumatra. Dr. Wallace considers that *S. panda* is confined to Java, while *S. nathalia* also occurs in Java, and in the Malay Peninsula, Sumatra, Borneo, the Philippine Isles, and Celebes. *S. panda* in the male is known by the pale primrose-yellow colour of the upperside, while *S. nathalia* is "creamy white with a faint greenish tinge." I greatly doubt if this character is sufficiently constant to separate the two species, I have one specimen from Sumatra which is quite intermediate between them. Mr. Distant considers that *S. nathalia* having five [three according to my way of computing them] subcostal nervules to the forewing in the male, while *S. panda* has only four [two], while the females of both species has four [two], is a character by which the two species may be separated, though he admits that he has a specimen of *S. nathalia* in which one wing has the neuration of *S. nathalia*, while the other has that of *S. panda*. In my series of thirty males of this genus, I have one from the Philippines and one from Singapore with two subcostal nervules only, one from Singapore, one from Great Nicobar, and one from Little Nicobar with two subcostal nervules on one side only and three on the other, while all the rest have three subcostal nervules on both sides. The females seem to be more constant, having two subcostal nervules only in all the specimens I have been able to examine. Neuration certainly will not suffice to keep these two species distinct. I use Felder's name for the species as most of the writers on Sumatran butterflies have done so, and as the majority of male specimens from thence agree with the description of that species rather than with that of *S. panda*, the older name. It has been beautifully figured by Heer P. C. T. Snellen as *Pieris panda*, Godart, in Midden-Sumatra, Lepidoptera, pl. ii, figs. 9, 10, *male*; 6, 7, *female* (1892). It is found only in the forest at low elevations, not higher than Namoe Oekor as far as we have noticed, but Dr. Hagen mentions its occurrence on the Central Plateau. Not at all common, and flies from March to July. The *Saletara schoenbergi* of Semper, described from Nias and South-East Borneo, also from Great and Little Nicobar in my collection, has been described and figured by

Snellen in Tijd. voor Ent., vol. xxxviii, p. 24, pl. i, fig. 3, *male* (1895), as *Pieris panda*, Godart, var.

561. HEBOMOIA BORNEENSIS, Wallace.

Grose Smith as *glaucippe*. Snellen as *glaucippe*. Hagen as *glaucippe*, var. *sumatrana*, Hagen; and *glaucippe*, var. *sumatrensis*, Hagen. Wallace as *glaucippe*. Distant as *glaucippe*. As will be seen above, all authors have recorded this species as *H. glaucippe*, Linnæus, except Dr. Hagen, who in his first Sumatran paper calls it *H. glaucippe*, var. *sumatrana*, and in his second paper *H. glaucippe*, var. *sumatrensis*, for the reason that other local races have been named *H. celebensis*, Wallace, *H. borneënsis*, Wallace, *H. philippensis*, Wallace, and *H. javanensis*, Wallace [nec *javaensis*, Hagen]. But Dr. Hagen's names cannot stand, as the Sumatran race is identical with the Bornean one which has already been named, and has the orange apical area on the upperside of the forewing in the male reduced to a patch half as large as that found in true *H. glaucippe* from North India, Burma, and the Malay Peninsula. The South Indian and Ceylonese form strangely enough agrees with the Javan, and should therefore be known as *H. javanensis*, Wallace. *H. borneënsis* is rare in our area. Dr. Martin has only once at Namoe Oekor captured a specimen himself, and Dr. Hagen records only two specimens from Sumatra. These three specimens were observed by their captors to settle quite suddenly on a low shrub with folded wings, having descended from a high and rapid flight. From Selesseh, Bohorok, and the outer ranges of the Battak mountains a few specimens have been obtained, including two females only; but on the western boundary of our area it must be very common, as the Gayoe collectors brought in hundreds of males. It flies from March to August, but is most abundant in May.

562. NEPHERONIA VALERIA, Cramer.

Wallace. Staudinger. Hagen. Semper as *lutescens*. *N. valeria* was originally described from a male from Java. *N. lutescens*, Butler, was originally described from a male from Borneo. Wallace, while retaining the Bornean form under *N. valeria*, says that the male has the forewing rather more elongated than in the typical Javan form, with a slightly concave outer margin. I have a large series of both sexes of *N. valeria* from the Malay Peninsula (called *N. lutescens* by Distant), Sumatra, Nias, Java, and Borneo. I find both sexes in all localities slightly variable, and I do not think it is possible to create (in the sense of separating them off into local races with distinctive names) local races for them. *N. valeria* is a very quick flying and restless insect, is not very rare at Selesseh and in the outer hills as far as Bekantschan, and is found from March to September, but not in any other month. The female is decidedly rare, and always has the basal markings on the upperside of both wings gamboge-yellow. It is a beautiful mimic of *Danais aspasia*, Fabricius.

563. HUPHINA NADINA, Lucas.

Snellen. Hagen as *remba*. The *Huphina remba* of Moore is a quite distinct species, and is confined to South India and Ceylon. *H. nadina* is very common at high elevations, at Soengei Batoe and on the Central Plateau, on the sandy banks of hill streams throughout the year. The female is very rare, and Dr. Martin has only obtained two specimens in thirteen years.

564. HUPHINA NERISSA, Fabricius.

Hagen as *Pieris nerissa*, Fabricius, var. *sumatrana*, Hagen. *H. nerissa* appears to be the oldest name for the species of this group, and was originally described from China, Butler records it from Hong-Kong, the Indian forms of which, generally known as *H. phryne*, Fabricius, appear to be highly variable and subject to seasonal dimorphism in all localities where the climate exhibits two well-marked seasons, a wet and a dry. Even specimens from a limited area and an equable climate like the Battak mountains in Sumatra shew considerable variation in the coloration of the underside of both wings, some examples being much richer yellow than others, and the black lining to all the veins greatly differing in width. It is much rarer than the foregoing species, but is found in the same localities from April to September, most numerous in May and July. Dr. Martin possesses no female.

565. HUPHINA LEA, Doubleday.

Grose Smith as var. *naomi*. Snellen. Hagen as *lea* and *amalia*. Wallace as *amalia*. Kirby as *amalia*. Distant as *amalia*. The "*Pieris*" *naomi*, Wallace, was described from Lombock and Flores, and is not at all likely to occur in Sumatra. "*Pieris*" *amalia*, Vollenhoven, was originally described from Sumatra and Banca, a female from the latter island being figured. Vollenhoven gives for "*Pieris*" *lea* the islands of Borneo and Banca, so that both species according to him occur in the latter island. Wallace keeps the two species distinct, and gives Borneo and Banca for *H. lea*, Singapore and Sumatra for *H. amalia*. I have a large suite of specimens of *H. lea* from Burma, the Malay Peninsula, Sumatra and Borneo, and am unable to find any constant character by which *H. amalia* can be distinguished from it.

Males of *H. lea* are common in the forests of both the plains and mountains, and we have specimens taken at Selesseh and Bekantschan from February to October, but none from the remaining months. The female is decidedly rare.

566. *HUPHINA JUDITH, Fabricius.

Hagen. *H. judith* is confined, as far as I am aware, to Java, where it replaces *H. lea*, Doubleday, of Borneo, Banca, Sumatra, the Malay Peninsula, and Burma. The occurrence of *H. judith* in Sumatra, is, I think, more than doubtful.

Subfamily PAPILIONINÆ.

567. TROIDES (*Trogonoptera*) BROOKIANA, Wallace.

Grose Smith as *brookeana* [sic]. Snellen as *brookeana* [sic]. Hagen as *brookeana* [sic]. Wallace as *brookeana* [sic]. Rothschild as *brookianus* [sic]. Distant as *brookeana* [sic]. Staudinger. Kirby. Occurs throughout the year in the plains and outer hills, not much higher than Bekantschan, at Selesseh, and even near Bindjei, in Padang Bedagei and Asahan down the coast; abundant at Quala Loemoerak near Bohorok, where the males are fond of frequenting a hot sulphur spring. The female is very rare, Dr. Martin obtained only three.

568. TROIDES (*Pompeoptera*) HONRATHIANA, Martin.

Ornithoptera honrathiana, Martin, Berl. Ent. Zeitsch., vol. xxxvii, p. 492 (1892); idem, id., Nat. Tijd. voor Neder.-Indië, vol. liii, p. 332, n. 1 (1893).

Martin. Hagen. Rothschild as *T. vandepolli honrathianus.* This is a local race of "*Papilio*" *van de polli*, Snellen, Tijd. voor Ent., vol. xxxiii, p. 22 (1890), from Java, differing therefrom in the abdomen in both sexes being very hairy and entirely black instead of more or less yellow beneath. It is found only on the Central Plateau, and never below 3-4,000 feet, and is not so rare as *T. cunifer*, Oberthür. The egg is salmon-coloured. The types were taken in December, but it probably flies all the year round.

569. TROIDES (*Pompeoptera*) HELENA, Linnæus.

Cramer as *minos.* Snellen. Grose Smith as *minos.* Kirby as *minos.* Hagen as *hephæstus.* Wallace as *pompeus.* *T. pompeus*, Cramer, by which name this species is generally known, was originally described from a female from Batavia in Java. *T. minos*, Cramer, was originally described from a female said to have come from the West Coast of Sumatra, but is really confined to S. India. *T. helena* is common throughout the year in the plains of Sumatra, but does not occur probably much higher than Namoe Oekor. It flies quite close to the sea, as Dr. Hagen took it plentifully in his garden near Laboean. There are two forms of female; I, with somewhat light, whitish forewing and very black hindwing, which is the rarer; II, with entirely black forewing, but with only small black spots on the hindwing, which is the commoner. Every gradation between these two extreme forms exists in Sumatra as elsewhere. Rothschild records the typical form from S.-E. Sumatra; also (b^2), ab. *pluto*, Felder, from S.-W. Sumatra; and (*d*), *T. helena cerberus*, Felder, from Sumatra.

570. TROIDES (*Pompeoptera*) AMPHRYSUS, Cramer.

Grose Smith. Hagen as *amphrysus*, var. *rubricollis* [sic]; and *amphrysus*, var. *ruficollis*. This species was originally described from a male from Batavia in Java. *T. ruficollis*, Butler, was described from Malacca in the Malay Peninsula. I can find no constant character by which to separate these two species, and Mr. Butler in his original description of the latter does not say how they are supposed to differ. Heer P. C. T. Snellen says also that the two species are identical. It occurs in Sumatra throughout the year in the plains and on the outer ranges of the hills, but not higher than Bekantschan, and is commoner than *T. helena*, Linnæus. Dr. Martin has twice bred it, the larva feeding on a creeper with large trilobate leaves. The egg is spherical and yellow, and in three or four days the caterpillars emerge. When full grown the larva is of a coffee-brown colour, and has on each segment four, five, or seven fleshy processes, those on the first four segments (omitting the head) are apically thickened and rounded and are bent backwards, on the other segments they are directed forwards. The larvæ devour not only the leaves, but also the bark and soft shoots of their food-plant if there are no more leaves to eat, and make a very audible noise while eating, just as the larvæ of large *Saturnias* do. They are very delicate, and especially so when they have fixed themselves for their transformation to the pupa state, when on no account should they be touched. The pupa is yellow, is dorsally notched, and is suspended by a black median silken girth. If the pupa is touched, disturbed in any way, or even blown upon, it makes quite a loud noise by moving the abdominal segments one over the other, which noise is so loud that it is probably sufficient to scare away some of its enemies. After from 26 to 29 days the imago emerges, which is the longest pupal rest known to us for purely tropical butterflies—at least as regards all such species as we have bred. Even the large *Papilios* such as *P. memnon*, Linnæus, do not remain more than 15 or 16 days in the pupal stage. Rothschild records (*c*) *T. amphrysus flavicollis*, Druce, (b^2), ab. *ruficollis*, Butler, from Sumatra.

571. Troides (*Pompeoptera*) cuneifera, Oberthür.

Ornithoptera amphrisius, Fabricius, ab. *cuneifera*, Oberthür, Etudes d'Ent., vol. iv, p. 110, n. 9 (1879).

Papilio (Ornithoptera) ritsemæ, Snellen, Notes from the Leyden Museum, vol. xi, p. 153 (1889).

Ornithoptera ritsemæ, var. *sumatrana*, Hagen, Iris, vol. vii, p. 19, n. 5 (1894).

Hagen as *ritsemæ*, var. *sumatrana*. Found from January to July only at high elevations to the south of Bekantschan and at Soengei Batoe. It is rare, as Dr. Martin in thirteen years obtained only three males and two worn females. He notes "That the Sumatran race of *T. ritsemæ*, originally described from Java, differs from Javan specimens in not having the two cuneiform velvety dark brown spots on the upperside of the abdomen; the forewing is coloured and marked exactly like Javan examples; the hindwing has the submarginal row of dusky powdered spots so very conspicuous and complete in Javan specimens very slightly indicated, faint, and reduced to one or two only, in Sumatran examples." Rothschild does not allow this species specific rank, but gives it in his exhaustive paper in "Novitates Zoologicæ," vol. ii, p. 232 (1895), entitled "A Revision of the *Papilios* of the Eastern Hemisphere, exclusive of Africa," under *Troides amphrysus*, Cramer, as (*d*), *T. amphrysus sumatranus*, Hagen. Unfortunately this paper only reached me when the whole of the present article was in print, so that on this occasion I am not able to give it full justice.

All *Troides* are true inhabitants of the forest, but the yellow species (*Pompeoptera*) in both sexes are very fond of flowers, *Hibiscus*, *Ixora*, and *Poinciana pulcherrima*, and so approach houses and are seen in the gardens, but they never settle on roads. *T. brookiana* (*Trogonoptera*) on the contrary never settles on flowers, but only on damp spots on roads and also near houses on manure heaps and kitchen middens. All of them were very appropriately named generically *Ornithoptera* by Boisduval, as on the wing they really look very much like birds, especially *T. brookiana*, which when sailing high over a road or in the forest has a most striking resemblance to the small and common Swift of the tropics. Usually they fly slowly, but if pursued their flight becomes extremely rapid, so that they are soon borne out of reach and sight. They never entirely settle on flowers, but seize them with their forelegs, they float above the flower by gently moving the wings for a few seconds, when they seek another. They are strong fliers, as the females in especial have to make long journeys to find the rare food-plant, when so flying they keep high up in the air, doubtless to overlook a large stretch of jungle. All *Troides* are early risers, and are already out at 7 o'clock in the morning; in the hottest hours of the day they are rarely seen, but appear again late in the evening at 5 or 6 o'clock, when with the exception of some *Satyrinæ*, *Amathusiinæ* and *Hesperiidæ* all other butterflies have gone to rest long ago. Mr. Walter Rothschild refers to the Malay Peninsula local race as *T. brookianus albescens*.

572. PAPILIO (*Menelaides*) ANTIPHUS, Fabricius.

P. antiphus, Hagen, Iris, vol. vii, p. 20, n. 12, pl. i, fig. 1, *larva* (1894).

Grose Smith. Snellen as *anthipus* [sic]. Hagen. Staudinger. In Trans. Linn. Soc. Lond., first series, vol. xxv, p. 20 (1865), Dr. Wallace records *P. diphilus*, Esper, = *P. aristolochiæ*, Fabricius, from Sumatra, ut this probably in error, as on page 43, n. 26 (*l. c.*) he omits Sumatra from the habitat of the species. It is not a little remarkable I think that *P. diphilus* should occur commonly in the Malay Peninsula and Java, between which Sumatra lies, but not in Sumatra itself, it being replaced by the present species. In Java both *P. diphilus* and *P. antiphus* are found. In Sumatra *P. antiphus* flies in the plains throughout the year and quite near the sea, is common at Laboean and Terdjoen, but certainly not much higher than Namoe Oekor. It is seen on roads, in gardens and orchards, near rivers, is plentiful on the above-mentioned *Veronica*-like blue flower, but not in large forest. It flies slowly and sails near the ground, and is the most common *Papilio* of Sumatra next to *P. polytes*, Linnæus. The larva is velvety black, with numerous black red-tipped fleshy tubercles or processes, the sixth segment is milky-white much as in *P. erebus*, Wallace. It feeds according to Dr. Hagen on the same *Piperacea* as *P. erebus*, Wallace, but Dr. Martin has also bred it on the common *Aristolochia indica*, Linnæus, and notes that the full-fed caterpillar feeding on the latter plant is reddish-brown throughout without the milky-white saddle-mark on the sixth segment. The pupa is brown, with blunt notches and protuberances. This larva, like that of *Troides amphrysus*, Cramer, eats not only the leaves but also the stalks of the food-plant. Rothschild does not consider *P. antiphus* to be a species distinct from *P. aristolochiæ*, but records it from Sumatra as (*g*), *P. aristolochiæ antiphus*, Fabricius.

573. *PAPILIO (*Menelaides*) COON, Fabricius.

Grose Smith. Wallace. Distant. There are typical specimens of *P. cöon* in Dr. Staudinger's collection from Padang in Western Sumatra, though the locality is somewhat doubtful, as the specimens may have been obtained from old collections with wrong labels given by dealers. It occurs also in Java and Borneo.

574. PAPILIO (*Menelaides*) DELIANUS, Fruhstorfer.

P. doubledayi, Wallace, var. *delianus*, Fruhstorfer, Ent. Nach., vol. xxi, p. 196 (1895).

Hagen as *doubledayi*. Originally described from Deli in Sumatra. Wallace gives *P. cöon*, Fabricius, from Sumatra, Java, and Borneo, and says that *P. doubledayi*, Wallace, the Indian form, differs from it in having the markings red instead of yellow. The Sumatran form in both sexes has the markings at the anal angle of the hindwing distinctly red, while *P. cöon* from Java has them equally distinctly yellow. The abdomen of our Sumatran examples is, however, more yellow than red. We have thus true *P. coön* occurring in Sumatra, and also an intermediate form between that species and the continental *P. doubledayi*, shewing the exact region where the one species is gradually becoming transformed into the other. *P. delianus* is rare in the forests of the plains and outer hills, is found at Selesseh, Namoe Oekor, and as high only as Bekantschan. It chiefly frequents the flowers of high trees and so is seldom caught. It has a fluttering but quick flight. Dr. Martin has specimens from so far south as Asahan. Rothschild does not allow *P. delianus* full specific rank, but records it is *P. cöon*, Fabricius, (*d*), *P. doubledayi delianus*, Fruhstorfer.

575. PAPILIO (*Menelaides*) NEPTUNUS, Guérin.

Hagen as *neptunus*, var. *sumatrana*, Hagen. The Malayan Peninsula form of *P. neptunus* as figured by Distant has four crimson spots on both sides of the hindwing in the male, while the Sumatran form has only two; the female has three spots on both sides in the Malayan Peninsula form, while the Sumatran has two on the upperside and three on the underside. In all other respects the species from these two localities agree as far as I can see. I have not seen specimens from Borneo, from whence *P. neptunus* is recorded by Wallace. It is certainly one of the remarkable butterflies of the world; the anal half of the abdomen in both sexes being of a bright chrome-yellow colour is in unique and startling contrast to the rest of the black abdomen and the black wings with the crimson spots on the hindwing. No doubt this staring yellow-tipped abdomen serves as a very efficient danger-signal or warning-colour to the enemies of butterflies to leave this particular species severely alone, the butterfly being obviously a protected one and with a very strong scent. It is quite as rare as *P. delianus*, Fruhstorfer, and is found in the same localities. Its flight is very slow and sailing, always high in the air and out of reach of the net. It is almost impossible to obtain perfect specimens. Rothschild records this species from Sumatra as *P. neptunus*, Guérin, (a^2), ab. *sumatranus*, Hagen, and notes that "This aberration is *not* confined to Sumatra, but seems to be there the usual form."

576. *PAPILIO (*Pangerana*) PRIAPUS, Boisduval.

Grose Smith. Wallace. Kirby. As far as I am aware, this species is confined to Java and Borneo (Rothschild, however, says that it "Does certainly not occur in Borneo"), but it is possible that it may be found in the extreme south-east of Sumatra adjoining Java. Dr. Wallace places it in the *memnon* group, but as the males differ greatly in shape from all the species of that group, and moreover have the abdominal margin of the hindwing folded over anteriorly twice as in the species of the *nox* group, *P. priapus* appears to me to be better placed in the subgenus *Pangerana*, Moore, of which *Papilio varuna*, White, is the type, and which will probably embrace *P. nox*, Swainson, and its allies. All the species of this group, as well as all *Troides*, have as imagines a very strong scent, and are certainly highly protected.

577. PAPILIO (*Pangerana*) SYCORAX, Grose Smith.

P. (*Pangerana*) *sycorax*, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. viii, p. 54, n. 15, pl. M, fig. 1, *male* (1893).

Grose Smith. Distant. Hagen. Originally described from Sumatra, but found also in the Malay Peninsula. In Sumatra it flies from Bindjei to south of Bekantschan, but not on the Central Plateau. We have numerous specimens from Selesseh, and Dr. Martin took it himself at Quala Minchirim near Bindjei, and at Roemah Kenangkong near Toentoengan, throughout the year. Dr. Hagen has quite recently caught it in Redjang in Southern Sumatra. It has a bold and high flight like a *Troides*, and is not easily captured, but in the forest near Selesseh there was a tree of *Jambosa aquæa*, Rumph., in flower, on which in July, 1893, the collectors obtained considerable numbers of both sexes by using a long bamboo-handled net. *P. erebus*, Wallace, *P. sycorax*, and *P. hageni*, Rogenhofer, are all apparently commoner in the female than in the male sex, which is the reverse of nearly all other species of *Papilio*. Herr Puttfarcken has observed a female of *P. sycorax* depositing eggs on a lime tree (*Citrus* sp.) at Bandar Quala in Serdang.

578. PAPILIO (*Pangerana*) HAGENI, Rogenhofer.

P. (*Pangerana*) *hageni*, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. viii, p. 55, n. 16, pl. M, fig. 2, *female* (1893); idem, id., Journ. A. S. B., vol. lxiii, pt. 2, p. 45, n. 39, pl. iv, fig. 6, *male* (1894).

Rogenhofer. Hagen. Originally described from Sumatra, where it flies throughout the year on the Central Plateaus of Tobah and Karo only rarely, the male even rarer than the female. Dr. Hagen has seen it on the wing, and describes the flight as "*memnon*-like;" it frequents the flowers of *Pavetta*. This butterfly as well as *P. sycorax*, Grose Smith, by reason of their curious white wigs proved very attractive to the Malay collectors, so they awarded them the name "Kapala Putih," which means "White Head." It may however have been due to the fact that they received an extra douceur for every Kapala Putih they caught that they took such interest in these two particular species.

579. Papilio (*Pangerana*) erebus, Wallace.

P. erebus, Hagen, Iris, vol. vii, p. 26, n. 25, pl. i, fig. 2, *larva* (1894).

Hagen as *noctis* and *erebus*. The *P. noctis* of Hewitson appears to be a distinct species confined to Borneo. *P. erebus* occurs in Sumatra throughout the year, as we have specimens caught in every month. It is absolutely restricted to the forest, and even there does not go to roads or rivers, but flies slowly through the thickest undergrowth, where it avoids the net very cleverly by its highly irregular and erratic flight, and by dodging amongst the bushes, consequently really perfect specimens are hardly ever obtained. The males are much rarer than the females, but may sometimes be caught on the borders of the forest on the sweet smelling *Veronica*-like blue flower of a small tree. The larva has been figured by Dr. Hagen, is brown with black markings, the sixth and seventh segments with a white saddle-like band, and the whole body is furnished with long fleshy tentacles very similar to those in *Troides*. It feeds on a *Piperacea* called "Dahoen Peandang" by the Malays. Dr. Martin saw three larvæ in Dr. Dohrn's possession in February, 1895. The pupa, according to Dr. Hagen, is exactly like that of the Javan *P. nox*, Swainson.

580. Papilio (*Araminta*) demolion, Cramer.

Grose Smith as *demoleon* [sic]. Snellen as *demolion*, Linnæus [sic]. Hagen. Wallace. Staudinger. Distant. Flies from March to July in the forests of the outer hills, from Selesseh to south of Bekantschan; is rather rare in our area; the males have a very quick and restless flight and frequent flowers, on which they do not settle, but abstract the honey while hovering. The larva feeds on *Citrus*, and is very similar to that of *P. polytes*, Linnæus, but is of a darker green colour. In Java it is very plentiful near Semarang.

581. PAPILIO (*Charus*) HELENUS, Linnæus.

Grose Smith. Snellen. Hagen. Wallace. Butler. Distant. Dr. Wallace separates off the Sumatran and Javan form of *P. helenus* from the North Indian form as a "Local form *b*," differing in being "Smaller; the third and fourth lunules from the anal angle beneath very small or quite absent." Next to *P. polytes*, Linnæus, and *P. antiphus*, Fabricius, this is our most common *Papilio*, a true inhabitant of the forest, found over the whole of our area, even on the Central Plateau, but most plentiful on the outer hills. The male has a quick and powerful flight, and frequents flowers and wet spots on forest roads. The female is rarer, and must be looked for in the forest when depositing her eggs. The larva is most common in February on different species of *Citrus*, it is superficially very similar to that of *P. memnon*, Linnæus, but is somewhat smaller and has brownish-red lateral streaks. The pupa is smaller and much more slender, but is coloured like that of *P. memnon*. The imago emerges in from 14 to 15 days. Rothschild records this species from Sumatra as (*e*), *P. helenus palawanicus*, Staudinger.

582. PAPILIO (*Charus*) ISWARA, White.

Hagen. Very rare in our area, more common on the western boundary, as most of the specimens received have been from the Gayoe-lands. Occasionally taken at Selesseh and Besitan. Found in the plains and outer hills. During a short collecting trip in Indragiri in the middle of Sumatra, Dr. Friedl Martin found this species very plentifully in February, 1895, but not a single specimen of *P. helenus*, Linnæus, was observed.

583. PAPILIO (*Charus*) NEPHELUS, Boisduval.

Grose Smith. Hagen as *albolineatus*, Fabricius [sic]; *nephelus*; and *nephelus*, var. *saturnus*. Wallace. Staudinger. Distant as *nephelus*, var. *saturnus*. Forbes as *saturnus*. Butler as *saturnus*. Distant notes that in a Sumatran specimen of this species in his collection "The pale stramineous markings above are more or less shaded with dark ochraceous." This remark probably applies to a female. *P. albolineatus*, Forbes, was described from Borneo, and is figured in Aid, vol. ii, pl. clxvi, fig. 1. We have seen no specimen of it from Sumatra, though Dr. Hagen has recorded it from thence. *P. nephelus* is rarer than *P. helenus*, Linnæus, and occurs throughout the year in the plains and on the outer hills, but not on the Central Plateau. It is also a true forest butterfly; the males have a very quick and restless flight, are fond of flowers, but settle only for a very brief period; never observed on roads. The larva feeds on different species of *Citrus*, the larva and pupa being practically identical with those of *P. helenus*, so that it is only when the imago emerges that one is able to know with certainty which species is being bred. The pupal state lasts about a fortnight. Rothschild records it from Sumatra as (*b*), *P. nephelus saturnus*, Guérin, (a^2), ♀-ab. *albolineatus*, Forbes.

584. Papilio (*Charus*) diophantus, Grose Smith.

P. diophantus, Grose Smith and Kirby, Rhop. Ex., vol. i, pl. *Papilio* i, figs. 4, *male*; 3, *female* (1887).

Grose Smith. Hagen as *diaphantus* [sic].

Habitat: N.-E. Sumatra.

Expanse: ♀, 4·7 inches.

Description: Female. Differs from the male in being larger. Upperside, *both wings* paler. *Forewing* with a diffused discal macular pale ochreous band from the inner margin to the lower discoidal nervule. *Hindwing* with the large quadrifid whitish patch of a deeper and more ochreous colour than in the male, and continued to the abdominal margin in a narrow decreasing deep ochreous band. Underside, *both wings* as in the male.

Restricted to Sumatra, and found, like *P. forbesi*, Grose Smith, only on the Central Plateau not below 3,000 feet. The males on sandy river beds throughout the year. The female is very rare, Dr. Martin obtained two or three only in thirteen years. Messrs. Grose Smith and Kirby say that their fig. 3 is taken from a female. If this is so (it looks like a male) it differs greatly from the female described above by me.

585. Papilio (*Iliades*) memnon, Linnæus.

Grose Smith. Snellen. Hagen as *memnon* and *esperi*. Wallace. Staudinger. Kirby. In Sumatra the female of this species is represented by four distinct forms:—

I. Tailless, nearest to the male; forewing with a red epaulette, *i.e.*, the base of the discoidal cell on the upperside is red; the disc of the forewing beyond the discoidal cell towards the apex is whitish, there are all gradations from a few whitish streaks only between the veins to a large apical white area bearing a few black streaks and crossed by the black veins, the extreme apex of the wing is always dusky. Abdomen quite black, with the exception of the extreme apex which is yellow. This form from Sumatra is figured by Wallace in Trans. Linn. Soc. Lond., Zoology, first series, vol. xxv, pl. i, fig. 3 (1865).

II. Tailless; forewing with a creamy-white epaulette; the disc of the forewing beyond the discoidal cell towards the apex not whitish, but nearly as dark as in the male, but of a somewhat duller shade. Hindwing has the abdominal margin on the upperside yellow. The posterior moiety of the abdomen rich chrome-yellow.

III. Tailless; forewing with a red epaulette; the disc of the forewing beyond the discoidal cell towards the apex whitish as in Form I. Hindwing on the upperside with a large outer discal white area, bearing a series of seven submarginal rounded black spots, of which the four posterior ones are somewhat cuneiform in shape, and are surrounded by the white area, the abdominal margin yellow as in Form II. Abdomen as in Form II.

IV. Tailed; the tails shew much variety, being sometimes spatulate, sometimes simple and straight without any apical swelling; forewing with a red epaulette. Hindwing on the upperside with a large discal white area consisting of eight spots, and filling the discoidal cell all except the base; the abdominal margin being yellow. Abdomen entirely yellow except for a dorsal median black streak.

Forms I and II are common, III is rather rare, IV is very rare, Dr. Martin obtaining seven specimens only. Dr. Martin has frequently bred it, and has obtained all four forms of the female from eggs laid by one mother. Four eggs deposited by a tailed female (Form IV), did not yield a single tailed descendant like herself. The larva is green with some whitish lateral streaks and bluish markings. The pupa is suspended on the leaves or stalks of its food-plant, *Citrus limonellus*, Hassk., and *Citrus decumana*, Linnæus, it is green with the upperside yellow: if suspended on wood it is greyish-brown of the same shade as the wood. On one occasion a larva suspended itself on a common blue, white, and red tin of Huntley and Palmer's biscuits, and this pupa was very bright, and exhibited some blue and red tints. After 14–15 days the imago emerges, on one occasion during a most unusual spell of dry weather, one specimen remained 43 days in the pupa stage. This example was a very fine and large tailed Form IV female, but all the other tailed females bred by Dr. Martin emerged as usual in about a fortnight. *P. memnon* is common throughout the year in the plains, not higher than Bekantschan, in gardens and orchards, near houses and villages everywhere where species of *Citrus* grow. It is most plentiful in March. The male has a quick, restless, undulating flight, it frequents flowers, but never goes to wet spots on roads, and is mostly busy in search of the female through the orange and lime thickets round the Malay villages. The female has a slower, more sailing flight, and is often to be seen on lime trees depositing her round green eggs one at a time on young shoots. The full-fed larva from Java has been figured by

Heer M. C. Piepers in Tijd. voor Ent., vol. xxxi, p. 350, pl. viii, fig. 5 (1888).

586. PAPILIO (*Iliades*) FORBESI, Grose Smith.

P. forbesi, Grose Smith and Kirby, Rhop. Ex., vol. i, pl. *Papilio* i, figs. 1, 2, *male* (1887); id., Martin, Nat. Tijd. voor Neder.-Indië, vol. liii, p. 335, n. 2 (1893).

Grose Smith. Hagen. The male is somewhat variable, on the upperside of the hindwing in some specimens the usual four anal grey lunules are almost obliterated. There are two forms of female:—

I. Forewing almost as in the male, somewhat paler only except the inner margin broadly towards the base. Hindwing with the anal half not quite touching the discoidal cell creamy-white, this area ending anteriorly at the second subcostal nervule; bearing in the submedian interspace an oval black spot which inwardly touches the narrow black abdominal margin, two conical equal-sized spots in the median interspaces, a conical but smaller spot than the two which precede it in the discoidal interspace; the margin bears five large black spots, of which those in the median interspaces alone are free. Underside, forewing somewhat paler than in the male. Hindwing has the basal red streaks as in the male, the large creamy-white area spotted with black as on its own upperside, but in the upper subcostal interspace there is an additional oval small whitish spot crowned with a few turquoise-blue scales, with some similar scales in the interspace above.

II. Similar to Form I, but the forewing has a creamy-white epaulette as in the Form II of the female of *P. memnon*, Linnæus, in Sumatra. It is possible that this form of *P. memnon* may mimic Form II of *P. forbesi*.

P. forbesi is found on the Central Plateau only, at a not less elevation than 3,000 feet above the sea, and flies all through the year. The male is common, and is caught on the sandy banks of hill streams; the female of both forms is excessively rare, Dr. Martin obtaining five specimens only. The first male was obtained by Mr. H. O. Forbes near Lake Ranau in Benkoelen quite in the south of Sumatra, the females described in 1893 by Dr. Martin were obtained in the previous year.

587. PAPILIO (*Laertias*) POLYTES, Linnæus.

Snellen as *pammon* and *polytes*. Grose Smith as *pammon* and *polytes*. Hagen. Wallace as *theseus*. Kirby as *numa*, Weber, and *antiphus*, De Haan (*nec* Fabricius). Distant. Dr. Wallace separates off the Sumatra, Java, Borneo, Celebes, Lombock, and Timor form from the India, Ceylon, China, and Malay Peninsula form, true *P. polytes*, under the name of *P. theseus*, Cramer, which differs in the male being

"Smaller, and the tail always reduced to a projecting tooth." Neither of these characters is constant, in specimens from N.-E. Sumatra the length of the tail especially is very variable, and it is often quite as long as in Indian specimens. In Sumatra *P. polytes* has two forms only of female:—

I. Very similar to the male.

II. Mimicking *P. antiphus*, Fabricius. This is the *P. theseus* of Cramer, Pap. Ex., vol. ii, pl. clxxx, fig. B (1777), described from the west coast of Sumatra; it is also figured by Wallace in Trans. Linn. Soc. Lond., first series, vol. xxv, p. 52, n. 63, pl. ii, fig. 7 (1865), from Sumatra. This form has practically no white spots on the disc of the hindwing as in the corresponding second form of the female of the Indian *P. polytes*, which there mimics *P. aristolochiæ*, Fabricius, a butterfly which in Sumatra is replaced by *P. antiphus*, though very rarely there is just a trace of a whitish spot in the discoidal cell. *Papilio numa*, Weber, was described from Sumatra, from the description it would appear to be the ordinary second form of the female of *P. polytes* found in India, so Weber's habitat is almost certainly incorrect. *P. polytes* is the most common *Papilio* of our area, and occurs probably everywhere except at the higher elevations and on the Central Plateau. It flies in gardens, orchards, on roads, near rivers, houses, and villages, and is always to be seen in the neighbourhood of lime trees. The females prefer to lay their eggs on young and low trees of species of *Citrus*, and deposit three or four eggs only on each bush. The young larvæ, like those of *P. memnon*, Linnæus, *P. helenus*, Linnæus, and *P. nephelus*, Boisduval, have a strong superficial likeness to a bird's dropping, which doubtless at this stage greatly protects them. The pupal stage is eleven days only. Heer M. C. Piepers has bred it in Java, and has figured three stages of the larva in Tijd. voor Ent., vol. xxxi, p. 352, pl. viii, figs. 6, 7, 8 (1888). Rothschild records it from Deli, Sumatra, as *P. polytes*, Linnæus, typical form; also as *P. polytes theseus*, Cramer, (g^1), ♀-f. *javanus*, Felder, from Sumatra, rare; also as *P. polytes theseus*, Cramer, (i^1), ♀-f. loc. *theseus*, Cramer, common.

588. PAPILIO (*Menamopsis*) PERSES, de Nicéville.

P. (*Menamopsis*) *perses*, de Nicéville, Journ. A. S. B., vol. lxiii, pt. 2, p. 46, n. 40, pl. iv, fig. 7, *male* (1894).

P. hewitsonii, Westwood, var. *sumatrana*, Hagen, Iris, vol. vii, p. 20, n. 11, (1894).

Hagen as *hewitsonii*, var. *sumatrana*. Also very rare, six specimens only in thirteen years, on high elevations not below 3,000 feet on the Central Plateau of the Karo Battaks and in the Gayoe territory in

November and January. The Hon. Walter Rothschild in Novitates Zoologicæ, vol. ii, p. 362 (1895), records this species as *P. slateri perses*, de Nicéville, from North-Eastern Sumatra. Neither Dr. Martin or I can agree with him in sinking *P. hewitsoni*, Westwood, from Borneo, and *P. perses* as sub-species of *P. slateri*, Hewitson, from N.-E. India, and *P. tavoyanus*, Butler, from Burma. The two latter have extensive blue markings on the upperside of the forewing, which the two former entirely lack, and no intergrades between them have been found, so we think that *P. hewitsoni* should stand as a full species, with *P. perses* as a local race.

589. PAPILIO (*Menamopsis*) PETRA, de Nicéville.

P. (*Menamopsis*) *petra*, de Nicéville, Journ. A. S. B., vol. lxiii, pt. 2, p. 47, n. 41, pl. iv, fig. 5, *male* (1894).

Described from a single example from the Gayoe mountains taken in January, 1893. No specimens have been obtained since. Rothschild records this species as (*c*), *P. slateri perses*, de Nicéville, (a^2), ab. *petra*, de Nicéville. He may be correct in assigning it to the position of an aberration only, but as the type is unique, it may be kept distinct for the present till further specimens are obtained and we know more about it. Mr. Rothschild's note is as follows:—"This insect has been discovered in the same district where *P. perses*, de Nicéville, was obtained, and it is most probably nothing but an atavistic example of the latter, provided it has the same structural characters as *P. slateri*, Hewitson. I have not had the opportunity to examine a specimen of this aberration." (Nov. Zool., vol. ii, p. 363 (1895).

590. PAPILIO (*Euplœopsis*) BUTLERI, Janson.

Grose Smith as *paradoxa*. Wallace as *paradoxa*, local form *b*. Hagen as *paradoxa*, var. *zanoa*. Dr. Wallace describes this species from Sumatra without naming it as follows:—"Smaller than *P. paradoxa*, Zinken-Sommer, from Java and Borneo; intermediate in the markings between the Java and Borneo forms; interior row of elongate marks on the upperside of the forewing light blue, not descending to the outer angle." Mr. Butler has described and figured three species of the *paradoxa* group from Sarawak in Borneo, viz., *P. zanoa*, *P. kerosa*, and *P. juda*. Without having the actual types to compare with Sumatran specimens, it is difficult to say if any of these supposed distinct species are the same as *P. butleri*; they are all obviously very nearly allied to that species and to one another. *P. butleri* was described from Malacca, and is recorded by Distant from Province

Wellesley and Kwala Lumpor in Selangor also in the Malay Peninsula. I possess two specimens from Quang and Kwala Lumpor. Sumatran specimens agree fairly well with Malay Peninsula ones, and with Distant's figure of the species, pl. xxvii*a*, fig. 6, *male*. Both sexes mimic the corresponding sexes of *Euplœa linnæi*, Moore. Dr. Martin has obtained two females only of *P. butleri*, which mimic the female of *E. linnæi*. It is rare in the plains and outer hills, near Selesseh, in Padang Bedagei and Asahan, also in the Gayoe territory, but certainly not much higher than Bekantschan, and flies from January to June and again in September, but in no other months. The males if undisturbed are on the wing exactly like *E. linnæi*, but as soon as they scent danger they assume the typical rapid flight of a *Papilio*. They are very fond of wet swampy spots on roads in the forest. The females are very scarce. Dr. Martin's brother bred it in Asahan in 1891 from larvæ found on a low shrub (not a creeper) in the forest; they were velvety black with fleshy red tubercles. The pupa, suspended by a black median girth, adheres by the three posterior abdominal segments to a branch of the food-plant, and looks like an obliquely cut off bit of stick as do the pupæ of all this group. The pupa is quite rigid, and has no motion in the abdominal segments whatever.

591. PAPILIO (*Euplœopsis*) ÆNIGMA, Wallace.

P. ænigma, Wallace, Trans. Linn. Soc. Lond., Zoology, first series, vol. xxv, p. 60, n. 83, pl. vii, fig. 3, *male* (1865).

Described by Wallace from Malacca, Sumatra, and Borneo. The specimen figured is from Sumatra. It is possible that the butterfly figured by Distant in Rhop. Malay., pl. xxvii, fig. 6, as the female of *P. butleri*, Janson, is the true female of *P. ænigma*. (Wallace records that species from Malacca as noted above, but Distant concludes that the Malaccan specimen so identified is the *P. butleri* described subsequently as a distinct species.) It is extremely difficult to say who is right, Wallace or Distant; the butterflies of this group are excessively rare, so that it is almost impossible to get together sufficient material to decide the point. Dr. Martin has two females only, one taken on the outer hills south of Namoe Oekor, in December, the other in Indragiri in the middle of Sumatra, in February. These specimens agree with Distant's figure above quoted, and I prefer to consider them to represent *P. ænigma* rather than to be a dimorphic form in the female of *P. butleri*. Dr. Martin, as noted above, possesses the ordinary form of the female of *P. butleri* which mimics the female of *Euplœa linnæi*, Moore, and was unknown to Distant.

592. PAPILIO (*Euplœopsis*) PENOMIMUS, Martin.

P. penomimus, Martin, Einige neue Tagschmetterlinge von Nordost-Sumatra (Munich), pt. 1, p. 2, n. 2 (1895).

This butterfly, though it has the *facies* of the species included in the *dissimilis* group (subgenus *Chilasa*), may belong to the *paradoxa* group (subgenus *Euplœopsis*), as it has the hindwing at the termination of the upper subcostal nervule produced, that being a characteristic feature of the species of the latter group. *P. penomimus* reminds one somewhat of *P. ramaceus*, Westwood, Trans. Ent. Soc. Lond., 1872, p. 95, pl. v, fig. 3, from Borneo, which species, however, is placed by Rothschild under *P. leucothoë*, Westwood. It is very rare in the forests of the plains and on the outer hills, occurs near Selesseh, at Bekantschan, and at Bandar Quala in Serdang from January to March and again in June. Dr. Martin bred it from some larvæ found by Herr O. Puttfarcken at Bandar Quala in Serdang in May, 1894. They feed on a low shrub in the forest called by the Malays "Dahoen Laksah," are velvety green and deep indigo blue, with round lateral red spots, and short fleshy tubercles. The pupa is similar to that of *P. butleri*, Janson, being suspended by a black girth to a stalk of the food-plant, the three posterior abdominal segments greatly flattened on the side touching the stick. As the stalk was still green, the pupa also was mostly green with brown and white markings. The imago emerged in 16 days.

From what I can gather from Mr. Rothschild's paper on *Papilios*, the three last named species all belong to *P. paradoxus*, Zinken-Sommer, sub-species *telesicles*, Felder. Mr. Rothschild's collection appears to contain only three males and one female of the group from Sumatra, of which he enumerates the female as *P. paradoxus telesicles*, Felder, (r^2), ♀-ab. *daja*, Rothschild. He does not say what his males are. When he wrote his paper Dr. Martin's description of both sexes of *P. penomimus* had not reached him. Dr. Martin writes to me that after examining Dr. Staudinger's collection at Dresden, he considers that the three species we have enumerated above are all one, and that in Sumatra it is trimorphic in the female. What he has described as the male of *P. penomimus* is an error, all his specimens of that species being females. Rothschild names Distant's figure in Rhop. Malay., pl. xxviia, fig. 6, *male* "(n^2), ab. *distanti*"; and Distant's figure pl. xxvii, fig. 6, *female*, "(u^2), ab. *nepticula*." As regards *P. ænigma*, Wallace, Rothschild records it as "(q^2), ♂-ab. *ænigma*, Wallace."

593. PAPILIO (*Euplœopsis*) ÆGIALUS, Distant.

P. velutinus, Butler, Ann. and Mag. of Nat. Hist., fifth series, vol. xvi, p. 343 (1885).

Grose Smith as *caunus*. Wallace as *caunus*. Butler as *velutinus*.

Originally described from the Malay Peninsula and is a local race of *P. caunus*, Westwood, of Java. It is one of a group which are amongst the most perfect mimics known, their models being the different local races of *Euplœa diocletianus*, Fabricius. It is very rare, Dr. Martin in thirteen years has obtained two specimens only, both males, in forest near Selesseh, the first on 23rd April, 1893, the second on 15th July, 1894. The first was captured by a very clever Chinese collector, who watched and followed the butterfly for nearly half the day before he was able to catch it. He correctly took it for a *Papilio*, but thought it might be a female of *P. butleri*, Janson. Rothschild records this species from Sumatra as *P. caunus ægialus*, Distant, and notes that "The type-specimen of *P. ægialus*, Distant, now in my collection, does not differ from that of *P. velutinus*, Butler, in the British Museum, except in the submarginal markings of the hindwing, which are a little smaller in *P. velutinus*; one of my three *P. ægialus* from the Malay Peninsula has these spots, however, not larger than the type of *P. velutinus*."

594. PAPILIO (*Achillides*) ARJUNA, Horsfield.

P. arjuna, Horsfield, var. *gedeensis*, Fruhstorfer, Ent. Nach., vol. xix, p. 287 (1893); idem, id., Stet. Ent. Zeit., vol. lv, p. 118 (1894).

Wallace. Hagen. Staudinger. Herr H. Fruhstorfer has recently described not only *P. gedeensis* from W. Java and Sumatra, but also *P. prillwitzi* from W. Java, and *P. tenggerensis* from E. Java, while admitting the occurrence of *P. arjuna* also in Java. I have not sufficient material to form an opinion as to whether or not all these four species (five including *P. karna*, Felder), all closely allied, and from one island, are distinct and valid. Herr Fruhstorfer has sent me specimens of *P. gedeensis* from Java which agree with my Sumatran examples of *P. arjuna*. They differ from Horsfield's figure of the latter in lacking a pale green band across the disc of the forewing on the upperside. In Sumatra specimens are found with and without the green band; the latter are the commoner. Further observations appear to be necessary before Herr Fruhstorfer's species can be accepted. *P. arjuna* in Sumatra is restricted to the Central Plateau, where it is common and flies throughout the year, as the collectors brought in specimens in every month. Is not nearly so shy or quick on the wing as *P. palinurus*, Fabricius. Rothschild places *P. tenggerensis* as a pure synonym of *P. arjuna*; he gives *P. gedeensis* as *P. arjuna*, Horsfield, (a^2), ab. *gedeensis*, Fruhstorfer; and allows *P. prillwitzi* full specific rank.

595. Papilio (*Achillides*) karna, Felder.

P. (*Achillides*) *discordia*, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. vii, p. 343, n. 17, pl. I, fig. 2, *male* (1892).

Hagen as *karna*. When describing this distinct species I overlooked *P. karna*, Felder, described from Java, as Mr. Kirby had placed it in his Synonomic Catalogue as a "var." of *P. arjuna*, Horsfield, instead of admitting its undoubtedly valid specific rank as he should have done. It is very rare, and occurs on the western boundary of our area in the Gayoe territory, from whence in thirteen years Dr. Martin obtained only ten specimens in the months of January and May. This fine species is much larger than *P. arjuna*. Mr. Rothschild considers *P. karna* to be a sub-species only of *P. arjuna*, and records it from Sumatra as (*b*), *P. arjuna karna*, Felder.

596. Papilio (*Harimala*) palinurus, Fabricius.

Grose Smith as *palinurus* and *brama*. Hagen as *palinurus* and *brama*. Wallace as *brama*. Butler as *brama*. Distant as *brama*. Kirby as *palinurus*, De Haan (*nec* Fabricius). No author as far as I am aware has ventured to point out how *P. palinurus*, Fabricius, and *P. dædalus*, Felder, are supposed to differ. Dr. Wallace in his paper on the *Papilionidæ* of the Malayan Region keeps *P. brama*, Guérin, described from the Malayan Coast, and *P. dædalus* distinct, but does not mention *P. palinurus* at all. The latter was described by Fabricius from Tranquebar. *P. palinurus* is found in Burma, the Malay Peninsula, Sumatra, Borneo, and the Philippine Isles, *P. dædalus* in the Philippines. A closely allied species is *P. crino*, Fabricius, erroneously described from Africa, but found from Northern India to Ceylon. I have a good series of *P. palinurus* from all the localities above named, and can find no single character by which to separate them. The exact position of the discal green band on the upperside of the hindwing seems to be inconstant, in some specimens it reaches well into the discoidal cell, in others it is bounded by the disco-cellular nervules. In Sumatra *P. palinurus* is found in the plains only of Deli and Langkat, occurring throughout the year, and is decidedly rare, but is somewhat commoner in Serdang. It flies in the forest and settles on wet spots on forest roads. It is fond of flowers, *Ixora*, *Lantana*, &c., goes to gardens, and is very shy and quick on the wing. It is not protected against birds, as Dr. Martin has often picked up wings without body.

597. Papilio (*Meandrusa*) payeni, Boisduval.

Grose Smith. Hagen. *P. evan*, Doubleday, from N.-E. India, is a local race of *P. payeni*, Boisduval, from which it differs chiefly in being larger. *P. payeni* was originally described from Java. Rare at high elevations, not below 2,000 feet in the Battak and Gayoe mountains in March and September. Only five specimens obtained in thirteen years. Rothschild records it from Sumatra and Borneo as (*b*), *P. payeni brunei*, Fruhstorfer, Ent. Nach., vol. xx, p. 300 (1894), originally described from Brunei, North Borneo.

598. Papilio (*Pathysa*) antiphates, Cramer.

P. itam-puti, Butler, Nat. Wand. in East. Arch., p. 276 (1885).

Snellen. Hagen as *antiphates*; and *antiphates*, var. *pompilius*. Wallace as *antiphates*, local form *a*, *Podalirius pompilius*, Swainson. Distant as *antiphates*, var. *pompilius*. This is a very variable species wherever it occurs, and as the variations found do not appear to be restricted to geographical areas, it does not seem possible to break up the parent species described from China into local races. It is common over the whole of our area, in and near forest, and throughout the year, but most abundant in March. The males come in crowds to wet spots on roads, and settle among a number of *Pierinæ*, where they evidently feel protected as they also have white wings; when on the wing they look like a "White," as their long tails when flying rapidly can hardly be seen. The females are only caught in the forest as they do not come to roads. Heer M. C. Piepers has bred it in Java, and has figured the larva in Tijd. voor Ent., vol. xxxi, p. 349, pl. viii, fig. 4 (1888). Rothschild records the typical race of *P. antiphates* from Eastern China; the Sumatran form as a subspecies, (*b*), *P. antiphates alcibiades*, Fabricius; with an aberration which "Seems to be the usual form in Sumatra, but occurs also in other localities," as (c^2), ab. *itamputi*, Butler.

599. Papilio (*Pathysa*) insularis, Staudinger.

P. agetes, Westwood, var. *insularis*, Staudinger, Iris, vol. vii, p. 349 (1895).

Hagen as *agetes*. Staudinger as *agetes*, var. *insularis*. This species was described from Sumatra interior, and the Kina Balu mountain in Borneo. I allow it specific rank with some misgivings. The Himalayan, Assamese, and Burmese forms (true *P. agetes*) have the second band from the base of the forewing ending at the submedian nervure, in the Malayan Peninsula form it ends in the middle of the submedian interspace (*vide* Distant's figure in Rhop. Malay., pl. xlii, fig. 8), in Sumatran specimens the band is the shortest of all, and ends on the median nervure. All the markings in the Malay Peninsula and Sumatra specimens are darker than in the typical Indian form. But all three forms evidently grade almost imperceptibly the one into the other.

Found only at high elevations, not below 3,000 feet, on the Central Plateau and in the Gayoe mountains, throughout the year, but most abundant in December and January, in which months the Battak collectors brought in hundreds of males. This butterfly, like species of *Charaxes*, very easily rots, as all specimens brought from the mountains if not properly dried at once in the sun or by the fire fall to pieces. Rothschild records this species from Sumatra as (*b*), *P. agetes insularis*, Staudinger.

600. PAPILIO (*Pathysa*) HERMOCRATES, Felder.

Hagen as *anticrates*, var. Flies only in the forests of the plains, where it is very rare. A few specimens only obtained at Paya Bakong near the sea in April, and one from near Selesseh in June. Dr. Hagen had only one specimen from the Gayoe-lands. Rothschild records it from Sumatra as (*d*), *P. aristeus hermocrates*, Felder.

601. PAPILIO (*Zetides*) EMPEDOCLES, Fabricius.

Hagen. This species appears to be migrating westwards, Dr. Wallace in 1865 recorded it from Borneo, it has within the last five years appeared in Sumatra, and in Malacca, Penang and Perak in the Malay Peninsula. In Sumatra only three specimens have been taken in June and December at a high elevation in the mountains. Rothschild records it from Java, Banka Island and Palawan.

602. PAPILIO (*Zetides*) EURYPYLUS, Linnæus.

Wallace as *jason*. Grose Smith as *eurypilus* [sic]. Snellen as *jason*. Hagen as *eurypylus* and *telephus*. Dr. Wallace in Trans. Linn. Soc. Lond., Zoology, first series, vol. xxv, pl. viii, fig. 4 (1865), has figured the outline of the costa of the forewing of this species from Sumatra. Heer M. C. Piepers has bred it in Java, and beautifully figured three stages of the larva under the name of *P. jason*, Esper, in Tijd. voor Ent., vol. xxxi, p. 347, pl. viii, figs. 1, 2, 3 (1888). Rothschild records this species from Sumatra as (*h*), *P. eurypylus axion*, Felder.

603. PAPILIO (*Zetides*) MECISTEUS, Distant.

Hagen. Rothschild does not allow *P. mecisteus* specific rank, he records it as (*h*), *P. eurypylus axion*, Felder, (b^2), ab. *mecisteus*, Distant.

604. PAPILIO (*Zetides*) EVEMON, Boisduval.

Wallace as *P. jason*, Esper, variety or dimorphic form *a*. Distant. Hagen. Dr. Wallace writes of this species:—"This may be a distinct species, but is more probably a case of dimorphism. The two forms

[*P. jason* and *P. evemon*] are absolutely identical, except that the red spot at the base of the hindwing on the underside, in *P. jason*, Esper, is constantly absent in *P. evemon*, Boisduval." Rothschild gives *P. evemon* full specific rank.

605. PAPILIO (*Zetides*) BATHYCLES, Zinken-Sommer.

Grose Smith. Hagen. Rothschild records the typical form from Java, and "Most probably also in South-West Sumatra," and the ordinary Sumatran form as (*b*), *P. bathycles bathycloides*, Honrath. These four last mentioned species are all inhabitants of the plains, where they occur throughout the year in and near forest, the males often settled in dozens on wet spots on roads. They are all quick and strong on the wing, but not quite as fast-flying as *P. sarpedon*, Linnæus. If chased away from their favourite spots they behave very like species of *Catopsilia*, and hurry up and down the forest roads in Indian file. *P. mecisteus*, Distant, and *P. bathycles* are somewhat the rarer, the latter is also found at higher elevations than the others, to the south of Bekantschan.

606. PAPILIO (*Dalchina*) SARPEDON, Linnæus.

Snellen. Hagen. Grose Smith. Wallace. Distant. Common all over our area, from the plains to a high elevation throughout the year on forest roads. The males sit often six or eight together on a wet spot on the road. It has a very strong, quick, and jerking flight. I have figured and described a highly melanic aberration of this species from Sumatra in Journ. Bomb. Nat. Hist. Soc., vol. viii, p. 54, n. 14, pl. L, fig. 11, *male* (1893). Heer M. C. Piepers has bred it in Java, and has figured the two final stages of the larva in Tijd. voor Ent., vol. xxxi, p. 346, pl. vii, figs. 8, 9 (1888). Rothschild records the typical form of the species from Sumatra.

607. PAPILIO (*Dalchina*) CLOANTHUS, Westwood.

Snellen. Hagen as *cloanthus*, var. *sumatrana*, Hagen. Rothschild records it from Sumatra as (*c*), *P. cloanthus sumatranus*, Hagen. The Sumatran form is slightly more melanic than the typical form from North India and Assam, that is to say, the black areas in the forewing are somewhat larger, thereby reducing the bluish-green markings somewhat. It is almost doubtful if Sumatran specimens could be correctly sorted out from Indian ones if the labels from both were removed and the specimens mixed up. The Western and Central Chinese form, *P. cloanthus*, var. *clymenus*, Leech, is a good local race, and can be distinguished at a glance. In Sumatra *P. cloanthus* is found on the Central

Plateau, not below 3,000 feet, where it occurs not very rarely throughout the year.

608. *PAPILIO (*Zetides*) ARYCLES, Boisduval.

Wallace as *rama*. Butler. As this species occurs in the Malay Peninsula and in Borneo, I have no doubt that Messrs. Wallace and Butler have correctly recorded it from Sumatra, though we have not met with it. The *P. rama* of Felder, is a synonym of *P. arycles*. Since the above was in type I find that Rothschild has four males from Palembang in the south of Sumatra.

609. PAPILIO (*Zetides*) AGAMEMNON, Linnæus.

Grose Smith. Snellen. Hagen. Wallace. Distant. Dr. Wallace records this species from Malacca, Sumatra, Borneo, and Java as local form *c*. "Size small; tail very short." The typical form of *P. agamemnon* he gives from India, and Manilla in the Philippine Isles. He has figured the outline of the costa of the forewing of this species from Sumatra in Trans. Linn. Soc. Lond., Zoology, first series, vol. xxv, pl. viii, fig. 6 (1865). Rothschild records the typical form from Sumatra. Heer M. C. Piepers has bred it in Java, and has figured all stages of the larva in Tijd. voor Ent., vol. xxxi, p. 341, pl. vii, figs. 1–7 (1888). It is common throughout the year everywhere in the plains where *Anona muricata* and *Michelia champaca*, Linnæus, the food-plants of the larvæ, are found, and frequents the flowers of the *Lantana*, &c., in gardens and near houses. As the butterfly is found also often in the forest, some wild species of *Anonaceæ* or an allied plant for the larva to feed on must grow there. The full-fed larva exists in two varieties, a bright transparent shining green form, and a yellow form, both having on the first three segments (omitting the head) a horny tubercle with orange base one on each side of each segment. The pupa, which bears a nose-like projection from the thorax directed forwards over the head, is green with some brownish markings, and is suspended by a white girdle. After 15 days the imago emerges from the pupa. The female butterfly prefers young low plants of the *Anona* on which to lay her eggs, as on young newly planted bushes four or five caterpillars are often found together. A "variety" of *P. agamemnon* from Western Java has been described and figured by Heer P. C. T. Snellen in Tijd. voor Ent., vol xxxvii, p. 71, n. 3, pl. iii, fig. 3, *female* (1890). It has all the usual macular green markings of the upperside of a deep ochreous colour, probably due to chemical action, possibly that of cyanide of potassium.

610. Papilio (*Paranticopsis*) xanthosoma, Staudinger.

P. maccareus [sic], Godart, var. *xanthosoma*, Staudinger, Iris, vol. ii, p. 7 (1889).

Hagen as *macareus*, Godardt [sic]; and *macareus*, var. *xanthosoma*. Staudinger as *macareus*; and *maccareus* [sic], var. *xanthosoma*. Occurs throughout the year in the plains (Selesseh and Paya Bakong), on the outer hills, and as far south as Soengei Batoe, also in the Gayoe territory; most abundant in November, March and April. In November, 1894, two Malay collectors brought in 104 male specimens collected in six days from Kepras near Bohorok. We have never seen a female. The male may be a mimic of *Danais vulgaris*, Butler, or, as it has a deep yellow abdomen, of *Danais banksii*, Moore. They fly exactly like a *Danais*, but betray themselves to the collector by coming to wet spots on roads, which *Danais* seldom do; also when settled they keep their wings in constant motion, whereas a *Danais* always rests with folded motionless wings. Rothschild records this species from Sumatra as (*c*), *P. macareus xanthosoma*, Staudinger.

611. Papilio (*Paranticopsis*) leucothoe, Westwood.

P. leucothoë, Westwood, var. *interjectus*, Honrath, Berl. Ent. Zeitsch., vol. xxxvii, p. 490 (1893).

Hagen as *leucothoë*; and *leucothoë*, var. *interjectus*. Distant. Staudinger. A variable species as regards the extent of the white markings in all the localities where it is found. Occurs in the forests of the plains (Selesseh), and outer hills (Namoe Oekor), not much higher than Bekantschan; also in Asahan and Indragiri. Rather rare in February and March, and again in September. Its habits on the wing are similar to those of *P. butleri*, Janson. It is doubtless a good mimic of a brown *Euplœa*. Rothschild records it from Sumatra as (*b*), *P. leucothoë interjectus*, Honrath.

612. Papilio (*Paranticopsis*) delessertii, Guérin.

Grose Smith. Hagen as *laodocus*. The *P. delessertii* of Guérin described originally from Pulo-Pinang, has priority over *P. laodocus*, De Haan, by one year. The butterfly is a beautiful mimic of *Ideopsis daos*, Boisduval. The female is paler than the male, from which it may instantly be known by the two spots beyond the discoidal cell bisected by the lower discoidal and third median nervules in the forewing being fused into a large quadrate patch. Found throughout the year in the plains and outer hills, most abundant from February to April, Dr. Martin took it himself near Paya Bakong not far from the sea. Very common on the western boundary of our area at Bohorok and in the Gayoe territory. The males come to roads and to sandy river banks; the females are very rare, and Dr. Martin obtained three only.

613. PAPILIO (*Paranticopsis*) MEGARUS, Westwood.

Hagen. Very rare in our area, perhaps less scarce on the western boundary, four specimens only obtained from January to March at Kepras and Bohorok. Dr. Hagen obtained a single example from the outer hills.

614. LEPTOCIRCUS CURIUS, Fabricius.

Grose Smith. Snellen. Hagen. Staudinger. Distant.

615. LEPTOCIRCUS MEGES, Zinken-Sommer.

Hagen. Staudinger as *virescens*. Both species of *Leptocircus* occur throughout the year in the plains and on the outer hills; they are fond of running water, and fly very low over open grassy places on river banks; they often settle on wet sand, but never on the grass. When flying they make constantly a strange vibrating motion with the hindwings, which adds to their strong likeness to dragonflies. The females are rare.

Family HESPERIIDÆ.

In the family *Hesperiidæ* we have followed the order given in Captain E. Y. Watson's paper in the Journal of the Bombay Natural History Society, vol. ix, p. 411 (1895), entitled "A key to the Asiatic Genera of the *Hesperiidæ*," which considerably changes the sequence of the genera in Captain Watson's previous paper in the Proceedings of the Zoological Society of London, 1893, p. 3, "A proposed Classification of the *Hesperiidæ*, with a Revision of the Genera."

616. ORTHOPHŒTUS PHANÆUS, Hewitson.

Grose Smith as *phaneus* [sic]. Occurs rarely in forest near Selesseh and on the outer hills, only two male specimens obtained, one in April, the other in August.

617. CHARMION FICULNEA, Hewitson.

C. ficulnea, de Nicéville, Journ. A. S. B., vol. lxiii, pt. 2, p. 49, n. 1 (1894).

Grose Smith. On the outer hills and near Bekantschan throughout the year not very commonly.

618. *CELÆNORRHINUS LADANA, Butler.

Astictopterus ladana, Elwes, Proc. Zool. Soc. Lond., 1892, p. 662, pl. xliii, fig. 4, *male*.

Grose Smith. I have never seen this species.

619. CELÆNORRHINUS LEUCOCERA, Kollar.

Throughout the year, but most plentifully in March, and fairly common from Bekantschan to the Central Plateau, never at lower elevations.

620. CELÆNORRHINUS SIMULA, Hewitson.

Pterygospidea simula, Hewitson, Ann. and Mag. of Nat. Hist., fourth series, vol. xx, p. 321 (1877).

Hewitson. Grose Smith. Originally described from Sumatra. Occurs at the same time, and in the same localities, as *C. leucocera*, Kollar, but is somewhat rarer.

621. CELÆNORRHINUS ASMARA, Butler.

Hagen as *acmara* [sic]. Very rare, only two specimens obtained from the mountains in October.

622. CELÆNORRHINUS AURIVITTATA, Moore.

Hagen. Common throughout the year from Selesseh to Bekantschan; very plentiful near Namoe Oekor. It is very quick flying, and always settles on the undersides of leaves near the ground.

623. COLADENIA DAN, Fabricius.

Snellen. Hagen. Staudinger. Common over the whole of our area, and flies throughout the year, often frequenting the same flowers as *Zemeros albipunctata*, Butler, and *Z. emesoides*, Felder, on which it settles in nearly the same manner, so that it is only when the insect is in the net that its identity can often be determined.

624. DAIMIO DIRÆ, de Nicéville.

D. diræ, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. x, p. , n. 37, pl. Q, fig. 49, *male* (1896).

Rare, five specimens only, from May to July near Selesseh and on the outer hills near Namoe Oekor.

625. SATARUPA GOPALA, Moore.

Only at higher elevations south of Bekantschan rarely throughout the year. It is an interesting fact that this butterfly, which has only hitherto been recorded from Sikhim, Assam, and Burma, should occur as far south as Sumatra.

626. SATARUPA AFFINIS, Druce.

The "*Tagiades*" *niphates*, Weymer, Stet. Ent. Zeit., vol. xlviii, p. 15, n. 13, pl. i, fig. 5, *male* (1887), from West Sumatra (Padang) is a synonym of this species. In Sumatra it occurs at the same elevations as *S. gopala*, Moore, but also lower down on the outer hills. It is a much commoner butterfly, and flies throughout the year.

627. *SATARUPA SAMBARA, Moore.

Hagen. This is probably an incorrect identification, the last-named species being intended. Herr G. Weymer notes (l. c.) that *Tagiades cosima*, Plötz, described from North India, is a synonym of this species.

628. ODINA HIEROGLYPHICA, Butler.

Excessively rare, only one specimen from Bekantschan in October, 1893.*

629. *TAGIADES JAPETUS, Cramer.

Snellen. Hagen. Originally described from Amboina. We have nothing from Sumatra agreeing exactly with Cramer's figure, which shews on the forewing the usual three subapical transparent white dots, two similar spots in the discoidal cell, and two on the disc divided by the second median nervule. It is very closely allied to the next species.

630. TAGIADES GANA, Moore.

Snellen. Hagen as *gaua* [sic]. Not rare in the plains.

631. TAGIADES ATTICUS, Fabricius.

Occurs commonly over the whole of our area.

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* I take this opportunity to describe a butterfly closely allied to *Odina hieroglyphica.*

ODINA ORTYGIA, de Nicéville, n. sp.

HABITAT: Dawnat Range, Tenasserim, Burma.

EXPANSE: Male, 1·45 inches.

DESCRIPTION: MALE. Closely allied to "*Plastingia*" *hieroglyphica*, Butler, described from Sarawak (Borneo), differing therefrom on both surfaces in having all the black markings reduced by half, all the orange markings therefore greatly enlarged. It may be said (to judge from Mr. Butler's figure) that *O. hieroglyphica* is a black insect with yellow spots, while *O. ortygia* is a yellow insect with narrow black lines dividing the surface into irregular orange tessellations.

I hope to more fully describe and figure this very beautiful butterfly at a subsequent date. The type is unique in my collection.

632. TAGIADES TOBA, de Nicéville.

T. toba, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. x, p. , n. 32, pl. T, fig. 47, *male* (1896).

Occurs somewhat rarely in March, April and October in the mountains south of Namoe Oekor.

633. TAGIADES DEALBATA, Distant.

Found rarely in the mountains south of Namoe Oekor.

634. TAGIADES RAVI, Moore.

Hagen as *rani* [sic]. Butler. Not uncommon in the plains.

635. TAGIADES PRALAYA, Moore.

Not common in the mountains south of Namoe Oekor.

636. TAGIADES TRICHONEURA, Felder.

Grose Smith. Hagen. Occurs rarely in the same regions as the last-named species.

637. TAGIADES PINWILLI, Butler.

Originally described from Malacca. Excessively rare, a single specimen only obtained on the outer hills on 9th July, 1894. I have both sexes of this species from Toungoo in Central Burma. All the species of *Tagiades* are true inhabitants of high forest, and are very quick on the wing, but they never fly for long distances, and settle often with outspread wings, mostly on the underside of leaves. The species which have white markings on the wings when flying look wholly white.

638. TAPENA LAXMI, de Nicéville.

Originally described from Upper Tenasserim and Perak; occurs also at Singla, below Darjiling, in May. In Sumatra it is rare in the forests of the outer hills near Namoe Oekor. Dr. Martin possesses three pairs only, taken in February, May to August, and December.

639. TAPENA THWAITESI, Moore.

Originally described from Ceylon. Is not the "*Plesioneura*" *atilia*, Mabille, var. *palawana*, Staudinger, Iris, vol. ii, pp. 157, 165, pl. ii, fig. 11, *male* (1889), the same species as, or very closely allied to, *T. thwaitesi*? The description and figure are said to have been taken from a male specimen, but the markings are those of the female of *T. thwaitesi*. This species is very rare in Sumatra, only two specimens having been obtained in April in the forest near Selesseh.

Dr. Martin informs me by letter from Munich that he possesses three specimens of a third species of *Tapena* which may perhaps be *T. agni*, de Nicéville. As I have not seen these specimens I cannot include them in the list.

640. ODONTOPTILUM ANGULATA, Felder.

Hagen as *angulatus* [sic]. Staudinger. The *Achlyodes sura* of Moore, described from N.-E. Bengal, is a synonym.

641. ODONTOPTILUM PYGELA, Hewitson.

Both species of *Odontoptilum* are common, *O. angulata*, Felder, at lower, *O. pygela* at higher elevations, and occur throughout the year. They frequent wet spots on roads, settling with wide-spread wings. *O. angulata* is called by the Malay collectors "Koepoe Tai ayam, The fowl's excrement butterfly," which is a very good description of its appearance.

642. *ASTICTOPTERUS JAMA, Felder.

Grose Smith. Butler. Distant. I have never been able to identify this species which was originally described from a male from the Malay Peninsula.

643. ASTICTOPTERUS OLIVASCENS, Moore.

Isoteinon melania, Plötz, Berl. Ent. Zeitsch., vol. xxix, p. 230, n. 26 (1885); *Astictopterus melania*, id., Stet. Ent. Zeit., vol. xlvii, p. 110, n. 4 (1886).

Hagen as *olivescens* [sic], and *Isoteinia* [sic] *melania*. Herr G. Weymer has sent me a coloured drawing of the type of "*Isoteinon*" *melania* in the collection of Herr Karl Ribbe. It appears to be the same species as *Astictopterus olivascens*, Moore, which latter species is not mentioned by Plötz in any of his papers, and appears therefore to have been unknown to him. *I. melania* was described from Malacca. In Sumatra *A. olivascens* is very common and ubiquitous throughout the year, and with *Padraona dara*, Kollar, is the commonest of our *Hesperiidæ*. The males are very fond of the flowers of a wild Geranium-like plant and are found on every roadside and hedge. The dark uniformly coloured butterfly has a pretty appearance when contrasted with the tiny red cup of the flower on which it is resting.

644. SANCUS PULLIGO, Mabille.

Grose Smith as *fuscula*. Hagen as *fuscula*. According to Captain Watson, "*Tagiades*" *fuscula*, Snellen (= "*Astictopterus*" *celunda*, Staudinger), is, as far as is known, confined to Celebes, while *S. pulligo*, Mabille (=*subfasciatus*, Moore, and *ulunda*, Plötz), occurs in South India, Burma, the Malay Peninsula, Java, Borneo, the Sulu Isles, and the Philippine Isles. In Sumatra it is common on the outer hills and plentiful near Namoe Oekor throughout the year.

645. KORUTHAIALOS XANITES, Butler.

Grose Smith. I sent a long suite of specimens of this genus allied to *K. xanites* to Captain Watson, who pronounces that amongst them are several undescribed species from Sumatra, to be discriminated by the length of the palpi and the greater or less prominence of the orange markings on both sides of the forewing. As this latter feature is apparently extremely variable I hesitate to describe any of these supposed new species, as before doing so I think that critical examination of the prehensores of the males of all the species of the genus should be made.

646. KORUTHAIALOS VERONES, Hewitson.

Astictopterus verones, Hewitson, Ann. and Mag. of Nat. Hist., fifth series, vol. i, p. 341 (1878).

Hewitson. Grose Smith. Originally described from Sumatra thus:—"Both sides rufous-brown. Underside of the anterior wing marked by a subapical rufous spot." This is one of the well-marked forms of the genus, which I possess also from Java. It occurs in Sumatra not uncommonly with *K. xanites*, Butler.

647. KORUTHAIALOS KERALA, de Nicéville.

K. kerala, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. x, p. , n. 33, pl. T, fig. 48, *male* (1896).

Somewhat rare, occurs in the mountains in May.

648. KORUTHAIALOS KOPHENE, de Nicéville.

K. kophene, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. x, p. , n. 34, pl. T, figs. 49, *male*; 50, *female* (1896).

A rarer species than the one last-named, we possess three or four specimens only from Sumatra. All the species of the genus are inhabitants of the forest, where they are chiefly found on grassy forest paths and on low flowers. They occur more abundantly at higher elevations south of Namoe Oekor.

649. SUADA SWERGA, de Nicéville.

S. swerga, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. ix, p. 372, n. 1 (1895).

This species has a wide range, occurring in Sikhim, Burma, the

Malay Peninsula and Java, as well as at Bekantschan in N.-E. Sumatra in November, rarely.

650. *SUASTUS GREMIUS, Fabricius.

Staudinger. A very common "Skipper" in India, Ceylon, and Burma, but we have not met with it in Sumatra.

651. SUASTUS TRIPURA, de Nicéville.

Tagiades tripura, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. vi, p. 392, n. 36, pl. G, fig. 39, *female* (1891).

Originally described from Perak; occurs also at Selesseh and in the outer hills of Langkat rarely in March and December, and in Java and Pulo Laut.

652. SUASTUS PHIDITIA, Hewitson.

Hewitson. Grose Smith. Kirby. Originally described from Sumatra, where it occurs rarely at Namoe Oekor.

653. IAMBRIX STELLIFER, Butler.

Grose Smith as *salsala*. Captain E. Y. Watson notes that "*I. stellifer* is quite distinct from *I. salsala*, Moore, with which it has been said to be synonymous. It is smaller and darker, and is entirely without the golden yellow scales on the upperside which are characteristic of *I. salsala*." It is a common species in the forests of the outer hills throughout the year. It has a very quick flight, and keeps close to the ground; being so small it is not easy to see when on the wing.

654. IAMBRIX SINDU, Felder.

Hagen. Grose Smith. Found in the same localities and at the same seasons as the last-named butterfly, but is rarer and not so quick on the wing.

655. GE GETA, de Nicéville.

G. geta, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. ix, p. 374, n. 39, pl Q, fig. 51, *male* (1895).

Described from Penang in the Malay Peninsula, and from N.-E. Sumatra, where it is very rare, a few males only having been obtained from Selesseh and the outer hills in July.

656. AMPITTIA MARO, Fabricius.

Thymelicus palemonides, Snellen, Midden-Sumatra, Lep., p. 28, n. 1 (1892).

Snellen as *palemonides*. Rare and very local in our area, found at Stabat and near Bandar Quala in Serdang.

657. AEROMACHUS INDISTINCTA, Moore.

Occurs at high elevations from Bekantschan to the Central Plateau from May to August.

658. LOPHOIDES IAPIS, de Nicéville.

Isoteinon iapis, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. v, p. 213, n. 15, pl. E, fig. 9, *male* (1890).

Originally described from Burma and the Malay Peninsula, occurs also in Java and Pulo Laut. In Sumatra it is found somewhat rarely from Selesseh to Bekantschan from July to October.

659. HYAROTIS ADRASTUS, Cramer.

Hagen as *phœnicis.* Very rare in Sumatra though so common in India, but occurs throughout the year at Paya Bakong and near Bindjei. In September, 1894, Dr. Martin noticed a plant of *Calamus* (rattan cane) in front of his house at Bindjei, the leaves of which were much eaten, and attached to the leaves were several empty and one full pupa of this species. The latter was affixed to a leaf closed with a web, and looked more like a living satyrine larva about to turn to a pupa than a real pupa of a hesperid. It was affixed quite flatly to the leaf, and was capable of considerable motion.

660. ITYS IADERA, de Nicéville.

I. iadera, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. ix, p. 379, n. 41, pl. Q, fig. 52, *male* (1895).

Described from Penang and the Battak mountains of N.-E. Sumatra, where it occurs throughout the year at high elevations south of Bekantschan.

661. ZOGRAPHETUS OGYGIA, Hewitson.

Hewitson. Grose Smith. Kirby. Originally described from Sumatra. Occurs throughout the year at Selesseh and Namoe Oekor in the forest, and has a very rapid flight. Fresh specimens have a beautiful bluish gloss on the upperside of both wings.

662. ISMA FERALIA, Hewitson.

Originally described from Java. Rare in the outer hills of Sumatra in September.

663. ISMA BONONIA, Hewitson.

In the outer hills in September, very rare.

664. ISMA INARIME, de Nicéville.

I. inarime, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. vi, p. 391, n. 35, pl. G, fig. 38, *male* (1891).

Originally described from Perak, found also in Pulo Laut. In Sumatra it occurs in the forest near Selesseh throughout the year, but is rare.

665. ISMA CORISSA, Hewitson.

Isoteinon indrasana, Elwes and de Nicéville, Journ. A. S. B., vol. lv, pt. 2, p. 441, n. 166, pl. xx, fig. 5, *female* (1887).

Originally described from Borneo, occurs also in Lower Burma and Tavoy. In Sumatra it is found in the mountains south of Namoe Oekor and Bekantschan in February, July, August, October, and December.

666. ISMA SUBMACULATA, Staudinger.

Plastingia submaculata, Staudinger, Iris, vol. ii, p. 149, pl. ii, fig. 8, *male* (1889).

Originally described from Palawan in the Philippine Isles. We possess specimens from Selesseh taken in October.

667. MATAPA ARIA, Moore.

Grose Smith. Hagen as *avia* [sic]. Occurs throughout the year in the plains somewhat plentifully. At Bindjei it entered Dr. Martin's house several times at 7 o'clock in the evening attracted by the just lighted lamps in the verandah.

668. MATAPA DRUNA, Moore.

From Bindjei to the outer hills in February and July; rarer than the last-named species.

669. MATAPA SASIVARNA, Moore.

Occurs in the plains and also at higher elevations, found at Bekantschan in July, August and December.

670. SEPA CRONUS, de Nicéville.

S. cronus, de Nicéville, Journ. A. S. B., vol. lxiii, pt. 2, p. 50, n. 42, pl. v, fig. 4, *male* (1894).

The type, which is still unique, was taken in the Battak mountains on 10th September, 1893.

671. ACERBAS ANTHEA, Hewitson.

A. anthea, de Nicéville, Journ. Bomb. Nat. Hist Soc., vol. ix, p. 382, n. 1 (1895).

Originally described from Singapore; occurs also in Tenasserim, Malacca, Java, and Borneo. In Sumatra a unique example was taken in the Battak mountains in August, 1894.

672. ZEA MYTHECA, Hewitson.

Originally described from Malacca. Dr. Martin obtained a single male example in the Battak mountains of N.-E. Sumatra in March, 1894.

673. ERIONOTA THRAX, Linnæus.

Snellen. Hagen. Distant. Very common everywhere throughout the year in ever following generations wherever species of wild or cultivated *Musa* ("Pisangs" in Malay, or Plantains) grow, on the leaves of which the larva feeds. The larva is white, covered with a white waxy powder, and has a black heart-shaped head. It lives in a shelter made of a portion of a rolled-up leaf. To make this shelter, it has to cut into the edge of one of the enormous leaves to obtain a suitable segment to be rolled up. The pupa is whitish, covered with the same white powder as is the larva, and is hidden from view in its dining room. This powder is of the greatest service to the animal, as in consequence of the heavy showers of rain of the tropics much water often collects in the rolled-up leaf, and the pupa if not so protected would soon be drowned and rot, as it is the powder keeps the pupa dry until the water has drained away or dried up. The butterfly emerges from the pupa in the early hours of the afternoon at 2 or 3 P.M., and is on the wing before sunrise and after sunset, and comes to the lights in the verandahs of houses. Even at the earliest dawn, between 4 and 5 A.M., Dr. Martin has noticed them flying round the plantain groves near his house. *E. thrax* often appears in large numbers, and then the caterpillars assist the south wind in giving the plantain leaves their usual torn and picturesque appearance; but as the leaves are but little used except by the Madrasi Tamils, who utilize small perfect portions as plates when eating, the larvæ cause no loss to anyone.

674. ERIONOTA ATTINA, Hewitson.

Semper. Originally described from a female from "India" and Java. Its male is the *Unkana batara* of Distant. It is rare at low elevations throughout the year, at Bindjei and in the plains generally.

675. ERIONOTA SANGUINOCCULUS, Martin.

E. sanguinocculus, Martin, Einige neue Tagschmetterlinge von Nordost-Sumatra, (Munich), pt. 1, p. 5, n. 3 (1895).

Described from a unique male example taken in the forest near Selesseh in May. In Dr. Hagen's collection is a second male specimen.

676. GANGARA THYRSIS, Fabricius.

Hagen. Grose Smith. Semper. The giant of the *Hesperiidæ* of our area, and much rarer than *E. thrax*, Linnæus, but occurs throughout the year in places where *Calamus* grows, on which the white waxy-powdered downy larva feeds. The pupa is hidden in three rolled-up leaves, and is fixed by the extremity of the abdomen to a woven tripod in such a way that it can move in all directions. As soon as its shelter is touched it makes such a loud rattling noise that anyone would be at least startled or frightened on first hearing it. Like *E. thrax*, the butterfly emerges from the pupa late in the afternoon (from 3 to 5 o'clock P.M.), and flies after sunset.

677. PADUKA LEBADEA, Hewitson.

Originally described from Borneo, but found in Ceylon (*subfasciata*, Moore), the Malay Peninsula (*glandulosa*, Distant), the Andaman Isles (var. *andamanica*, Wood-Mason and de Nicéville), N.-E. Sumatra, and Java. It is very rare in our area, in all the time Dr. Martin was in Sumatra he only obtained three specimens near the village of Selesseh in March and April.

678. KERANA ARMATUS, Druce.

Found only at higher elevations, from Bekantschan to the Central Plateau, where it is fairly common and occurs throughout the year.

679. KERANA GEMMIFER, Butler.

Butler. Occurs from Selesseh to Bekantschan rather rarely throughout the year.

680. KERANA DIOCLES, Moore.

Tagiades maura, Snellen, Midden-Sumatra, Lep., p. 28, n. 1 (1892).

Hagen as *maurus* [sic]. Grose Smith as *diocles*. Found commonly throughout the year from Selesseh to the Central Plateau. Flies near villages and houses, on roadsides and open places, never in the large forests.

681. KERANA FULGUR, de Nicéville.

K. fulgur, de Nicéville, Journ. A. S. B., vol. lxiii, pt. 2, p. 55, n. 46, pl. i, fig. 6, *female* (1894); idem, id., Journ. Bomb. Nat. Hist. Soc., vol. ix, p. 383, n. 42, pl. Q, fig. 54, *male* (1895).

Occurs in Selesseh and in the outer hills rarely throughout the year. Dr. Martin and I obtained four pairs only.

682. PIRDANA HYELA, Hewitson.

Hagen. Originally described from Java, from whence I possess both sexes. Found also at Sungei Ujong in the Malay Peninsula. In this species the underside of both wings is striped with green along the veins, in *P. pavona*, de Nicéville, the underside is not thus marked. We possess only four specimens taken in Bekantschan in July and August.

683. PIRDANA PAVONA, de Nicéville, n. sp.

HABITAT: Perak in the Malay Peninsula; N.-E. Sumatra; Java.

EXPANSE: ♂, 1·85 to 2·25; ♀, 1·90 to 2·30 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* glossy hair-brown. *Forewing* unmarked, the *cilia* brown. *Hindwing* unmarked, the *cilia* yellow, narrow anteriorly, wide posteriorly, and the yellow colour extending on to the wing membrane broadly at the anal angle. UNDERSIDE, *both wings* very dark verditer green. *Forewing* with the inner margin broadly as far as the median nervure and second median nervule dark ochreous, merging anteriorly into dark brown; the *cilia* pale brown. *Hindwing* unmarked, except that the anal angle is somewhat broadly brown anterior to the broad outer yellow area, which latter, together with the *cilia*, are as on the upperside. *Body* above dark brown. *Palpi* and *body* beneath with a small anal tuft yellow. FEMALE. UPPERSIDE, *both wings* glossy hair-brown. *Forewing* with the basal half glossed with deep shining steel bluish-green. *Hindwing* with the basal two-thirds glossed with the same colour; the yellow colour at the anal angle twice as broad as in the male. UNDERSIDE, *both wings* with the green ground-colour of a much paler shade than in the male. *Hindwing* with no brown area at the anal angle, the angle itself even more broadly yellow than on the upperside.

Allied to *Hesperia ismene*, Felder, from Celebes; *Hesperia hyela*, Hewitson, from the Malay Peninsula, Java and Sumatra; and *Pirdana rudolphii*, Elwes and de Nicéville, from Sikhim, the Khasi Hills and Tavoy in Lower Burma, but differing therefrom in the ground-colour of the underside being uniformly green, instead of dark brown with the green colour arranged in stripes along the veins.

Described from one male from Perak, a single male from the Battak mountains of N.-E. Sumatra taken in January, and a male and two females (the types) from Java, received without precise locality from Herr H. Fruhstorfer.

684. PLASTINGIA CALLINEURA, Felder.

Originally described from Java. *Hesperia latoia*, Hewitson, described from Singapore, is a synonym, as is also I believe *P. margherita*, Doherty, from Margherita and Sadiya in Upper Assam, and *P. fruhstorferi*, Snellen, from Java. *P. callineura* appears to be a very variable species not only in colouring but also in size, as our specimens measure in expanse of wings from 1·15 to 1·75 inches. In Sumatra it is common in the forests of the outer hills south of Namoe Oekor throughout the year. It settles with folded wings. It requires a skilled eye to distinguish it when at rest from common species of *Padraona* or *Telicota*.

685. PLASTINGIA HELENA, Butler.

Hagen. Is much rarer than the last-named species, but occurs throughout the year from Selesseh to Bekantschan.

686. PLASTINGIA VERMICULATA, Hewitson.

P. vermiculata, de Nicéville, Journ. A. S. B., vol. lxiii, pt. 2, p. 56, n. 47, pl. v, fig. 15, *male* (1894).

Hewitson. Grose Smith. Originally described from Sumatra; occurs in the Battak mountains near Bekantschan in July rarely, only two or three specimens obtained.

687. PLASTINGIA TESSELLATA, Hewitson.

Originally described from Macassar in Celebes. The markings of the underside are stated to be "yellow." The "*Hesperia*" *eulepis* of Felder, described also from Celebes, is said to have the markings on the underside "ochraceo-sulphureis," and is almost certainly a synonym. The next-named species is given by Captain Watson as a synonym also, but it has the markings of the underside "pure silvery white." I believe it to be distinct. *P. tessellata* is very rare, two or three specimens only have been taken near Bekantschan in July.

688. PLASTINGIA NAGA, de Nicéville.

Hesperia ? naga, de Nicéville, Journ. A. S. B., vol. lii, pt. 2, p. 89, n. 37, pl. x, fig. 2, *female* (1883).

Occurs at Sibsagar in Upper Assam, Singapore, N.-E. Sumatra, and Java. Not less rare than the two foregoing species, four or five specimens only obtained in March, June and December. Dr. Martin caught it himself commonly in Singapore in February, 1895.

689. LOTONGUS CALATHUS, Hewitson.

Hewitson. Hagen. Grose Smith. Distant. Snellen. Kirby. Originally described from Sumatra. I possess specimens from the

Dawnat Range in Middle Tenasserim, Burma, and from Java. It is very rare in our area, a few specimens only have been obtained in March and May on the outer hills. It is probable that the "*Hesperia*" *traviata* of Plötz (see No. 756) is a synonym of this species. "*Eudamus*" *calathus* is nowhere mentioned by Plötz, and appears to have been unknown to him.

690. LOTONGUS SCHÆDIA, Hewitson.

L. maculatus, Distant, Rhop. Malay., p. 372, n. 2, pl. xxxv, fig. 1, *male* (1886).

Hewitson. Grose Smith as *schœdia* [sic]. Kirby. Originally described from Sumatra. Distant described it from Malacca. I possess specimens from Perak in the Malay Peninsula. The *Lotongus parthenope*, Weymer (de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. vii, p. 354, n. 22, pl. J, figs. 4, *male*; 5, *female* (1892), is quite distinct from this species, still more so from *L. calathus*, Hewitson. *L. schædia* is commoner in Sumatra than *L. calathus*, but is always somewhat scarce, and occurs throughout the year from Selesseh to Namoe Oekor and on the outer hills. Dr. Martin caught it fairly commonly in February, 1895, on the small Dutch island of Riouw near Singapore.

691. *LOTONGUS AVESTA, Hewitson.

L. avesta, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. ix, p. 383, n. 43, pl. Q, fig. 56, *female* (1895).

Hewitson. Grose Smith. Kirby. Originally described from Sumatra. Mr. H. J. Elwes has specimens from Pulo Laut near Borneo, and I have a single female example from the Ataran Valley, Tenasserim, Burma.

692. LOTONGUS EXCELLENS, Staudinger.

Proteides excellens, Staudinger, Iris, vol. ii, p. 141, pl. ii, fig. 6, *male* (1889).

Originally described from Palawan in the Philippine Isles. Superficially it reminds one instantly of *Hasora* (*Parata*) *chuza*, Hewitson. It is very rare at high elevations south of Bekantschan, only four specimens were obtained in March and August of the last year of Dr. Martin's residence in Sumatra.

693. ZELA ZEUS, de Nicéville.

Z. zeus, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. ix, p. 388, n. 44, pl. Q, fig. 57, *male* (1895).

Occurs rarely at Selesseh and in the Battak mountains in May. The type is from Pulo Laut near Borneo.

694. HIDARI IRAVA, Moore.

Hagen. Grose Smith. Staudinger. Snellen. Very common and occurs throughout the year in ever following generations everywhere where the cocoa-nut palm grows, on the leaves of which the larva feeds together with *Amathusia phidippus*, Johanssen (*vide ante*, p. 393). The female always lays her eggs on young leaves, and the larvæ are sometimes so abundant as to do appreciable damage to the palms by devouring all the leaves. The larva is of a dirty green colour with subdorsal black stripes and an ochreous head, and is hidden from view between two leaves of the food-plant woven together. The pupa is reddish-brown. The butterflies are on the wing early in the morning and after sunset, and often come to the lighted lamps. In the daytime they rest with folded wings in dark places near houses. Once in 1892 all the cocoa-nut trees near the Manager's house at Namoe Oekor were eaten up by the larvæ, and later hundreds of the butterflies took shelter during the day in the house. None of them rested on the white-washed walls, but all on the dark curtains and portières.

695. HIDARI DOESOENA, Martin.

H. doesoena, Martin, Einige neue Tagschmetterlinge von Nordost-Sumatra, pt. 1, (Munich), p. 6, n. 4 (1895).

The name given to this species by Dr. Martin is Dutch, and is pronounced *dusuna* not *desena*. It has been described from six males only taken in August near Bekantschan.

696. *HIDARI HARMACHIS, Hewitson.

Astictopterus harmachis, Hewitson, Ann. and Mag. of Nat. Hist., fifth series, vol. i, p. 341 (1878).
Hidari staudingeri, Distant, Rhop. Malay., p. 395, n. 3, pl. xxxv, fig. 25 (1886).

Hewitson. Grose Smith. Hewitson described this species from a specimen in his collection from Sumatra, and referred to another in Dr. Staudinger's collection from Malacca. Mr. Distant described it as a "new species" from a Malaccan specimen, also in Dr. Staudinger's collection, probably the one Hewitson referred to. Distant also referred to *Astictopterus ? harmachis*, but failed to recognise it (l. c., p. 404). We have not seen this species.

697. ERIONOTA ELIA, Hewitson.

E. elia, de Nicéville, Journ. Bomb. Nat. Hist. Soc. vol. ix, p. 396, n. 1 (1895).

Hewitson. Grose Smith. Butler. Kirby. Distant. Originally described from Sumatra, where it occurs in our area at Selesseh and on the outer hills from May to August.

698. EETION MARTINI, Distant.

Zea martini, Distant, Ann. and Mag. of Nat. Hist., fifth series, vol. xix, p. 274, n. 187 (1887).

Originally described from Northern Borneo. In our area it occurs rarely at Selesseh, Namoe Oekor, and on the outer hills in April, July, August, October and November. It has a rapid flight, and when flying appears to be entirely white.

699. PITHAURIA (*Pithauriopsis*) AITCHISONI, Wood-Mason and de Nicéville.

Pithauriopsis aitchinsoni, Wood-Mason and de Nicéville, Journ. A. S. B., vol. lv, pt. 2, p. 387, n. 233, pl. xv, fig. 4, *male* (1886).

Originally described from Cachar; it is common in the forests of Middle Tenasserim, Burma, where I have taken it sucking up moisture on the banks of streams in October. It is found also in Java and N.-E. Sumatra, where it flies throughout the year somewhat scarcely on the outer hills.

700. NOTOCRYPTA FEISTHAMELII, Boisduval.

Snellen. Staudinger as *alysos*. Captain Watson gives the "*Plesioneura*" *alysos* of Moore as a synonym of this species. Common all over our area throughout the year in shady grassy places in or near forest.

701. NOTOCRYPTA RESTRICTA, Moore.

Found always with the last-named species, but is somewhat rarer.

702. NOTOCRYPTA MONTEITHI, Wood-Mason and de Nicéville.

Plesioneura monteithi, Wood-Mason and de Nicéville, Journ. A. S. B., vol. lv, pt. 2, p. 391, n. 245, pl. xviii, figs. 3, 3*a*, *female* (1886).

Originally described from Cachar. It is exceedingly rare, I possess a single female example from Sumatra.

703. *NOTOCRYPTA ALBIFASCIA, Moore.

Hagen as *albofascia* [sic]. Originally described from Hatsiega, Tenasserim, Burma. It is probable that Dr. Hagen identified the last-named species under this name, as the two are very closely allied.

704. NOTOCRYPTA NEÆRA, de Nicéville.

N. neæra, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. vi, p. 379, n. 25, pl. G, fig. 27, *female* (1891).

Originally described from Perak in the Malay Peninsula, occurs also in Tenasserim, Burma. It is very rare in our area, only two specimens having been obtained from the higher mountains in March.

705. UDASPES FOLUS, Cramer.

Hagen as *folus*, Fabricius [sic]. Grose Smith. Common and ubiquitous throughout the year in gardens and on grassy places and roadsides; never in forest.

706. GEHENNA GRÆÆ, de Nicéville.

G. grææ, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. ix, p. 399, n. 47, pl. Q, fig. 59, *male* (1895).

Described from a unique male taken on 23rd January, 1893, at Namoe Oekor.

707. CUPITHA PURREEA, Moore.

Very rare in the forest near Selesseh, only four specimens obtained in May.

708. TELICOTA AUGIAS, Linnæus.

T. augias, Wood-Mason and de Nicéville, Journ. A. S. B., vol. lv, pt. 2, p. 384, n. 224, pl. xvii, fig. 1, *male* (1886).

Snellen. Hagen. Distant.

709. TELICOTA BAMBUSÆ, Moore.

Hagen. Both the species of *Telicota* are common in the plains throughout the year, and are very fond of flowers.

710. PADRAONA DARA, Kollar.

Grose Smith as *mæsa* [sic]. There is little doubt I think that "*Pamphila*" *mæsa*, Moore, is a synonym of "*Hesperia*" *dara*, Kollar. It is more than probable that several species are included under this name. Nearly everywhere where the genus is found, individuals are very numerous, and these to a certain extent can be superficially sorted into apparently distinct species by size and colour, but until the prehensores of the males of a large number of specimens from various localities have been carefully, critically and exhaustively studied, there does not appear to be much hope of correct specific diagnosis. *P. dara* is the commonest and most ubiquitous of the *Hesperiidæ* in our area, and flies all the year round.

711. *PADRAONA MÆSOIDES, Butler.

Hagen. Originally described from Malacca. I have never been able to recognise it with any degree of certainty.

712. * PADRAONA SUNIAS, Felder.

Snellen. Hagen. Originally described from Amboina, but has never been figured.

713. PADRAONA PAVOR, de Nicéville.

P. pavor, de Nicéville, Journ. A. S. B., vol. lxiii, pt. 2, p. 53, n. 44, pl. iv, fig. 8, *male* (1894).

Found only at high elevations throughout the year on the Central Plateau, not below 3,000 feet elevation, where it is as common as *P. dara*, Kollar, is in the plains.

714. PADRAONA GOLA, Moore.

Much rarer than *P. dara*, Kollar, but occurs all over our area and throughout the year in the plains.

715. PADRAONA PARAGOLA, de Nicéville, n. sp.

HABITAT: N.-E. Sumatra.

EXPANSE: ♂, ♀, 1·1 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* fuscous, with rich ochreous markings. *Forewing* with the base (especially towards the costa) irrorated with golden-coloured scales; a broad oblique discal band from the inner margin near the base of the wing almost to the costa towards the apex of the wing, crossed by the black veins, on the side facing the costa anteriorly with a very irregular, posteriorly with an even, edge, the side facing the outer margin with an even edge; anteriorly at the end of the discoidal cell indented with a tooth of the fuscous ground-colour; the band is narrow at both ends, broad in the middle. *Hindwing* with a large oval patch occupying the middle of the wing not reaching the costa or the abdominal margin; the base thickly clothed with long golden-coloured setæ. UNDERSIDE, *forewing* black, irrorated throughout, except the basal portion broadly of the inner margin, with golden-coloured scales; the discal band as on the upperside; a somewhat narrow marginal golden-coloured band, broadest at the costa, narrowing posteriorly, not quite reaching the inner angle of the wing; an anteciliary fine black line. *Hindwing* black, heavily irrorated throughout with golden-coloured scales; the discal oval patch as on the upperside, but bearing anteriorly at the end of the discoidal cell a small black spot; a narrow marginal golden-coloured line, and an anteciliary fine black line. *Cilia* throughout golden-coloured, broad on the hindwing, somewhat infuscated anteriorly in the forewing. *Head* and *body* black, but thickly clothed with ochreous setæ. *Antennæ* anteriorly black, posteriorly annulated with yellow, the thick portion of the club beneath entirely yellow. FEMALE. UPPERSIDE, *both wings* with the ground-colour and markings duller, the latter narrower, than in the male. *Forewing* with no golden-coloured irrorations at the base of the wing. UNDERSIDE, *both wings* duller coloured throughout than in the male, the discal patch on the hindwing distinctly whitish.

Nearest to "*Pamphila*" *gola*, Moore, described and figured from Port Blair in the South Andaman Isles. A synonym of this species is *Padraona goloides*, Moore, described and figured from Ceylon. I have carefully compared specimens of these two species from the abovenamed islands, and find that the differences relied on by Mr. Moore to separate them are absolutely inconstant. The following are recorded localities for *P. gola*:—Port Blair, South Andamans; Mergui; Thaing, King Island (Mergui Archipelago) (*Moore*); Silcuri (Cachar) (*Wood-Mason* and *de Nicéville*); Sumba; Sambawa (*Doherty*); Buxa (Bhutan) (*Elwes*); Kiukiang (Central China) (*Leech*); Sikhim (*de Nicéville*); Nilgiri District (*Hampson*); and I possess specimens from the following hitherto unrecorded localities;—Calcutta; Orissa; Travancore; Perak (Malay Peninsula); N.-E. Sumatra; Nias; Java; S.-E. Borneo; and Celebes. *P. goloides* has been recorded from Ceylon by Moore, and from Singapore and Java by Distant. "*Pamphila*" *naranata*, Moore, is a MS. name for *P. goloides* in Horsfield and Moore's Cat. Lep. Mus. E. I. C., vol. i, p. 251, n. 565 (1857), and was recorded from Java. I have been informed by Mr. G. F. Hampson that *Pamphila augustula*, Herrich-Schäffer, from Cape York (Northern Australia) and the Fiji Islands is another synonym. Dr. Staudinger also records a "*Pamphila*" *goloides*, Moore, var. *akar*, Mabille, from Palawan (Iris, vol. ii, p. 146 (1889), which may be another synonym. *P. paragola* differs from *P. gola* on the upperside of the hindwing in having the discal patch broader in the middle thereby causing it to be oval instead of lengthened or band-like in shape; this feature is especially marked on the underside. The golden irroration of the underside almost throughout is peculiar to *P. paragola*. There are other smaller differences which are very obvious when specimens of the two species are compared side by side, but are difficult to express in words. I hope to figure *P. paragola* shortly.

Described from two males and one female in my collection.

716. PADRAONA PALMARUM, Moore.

Very rare, but every year Dr. Martin caught a few specimens round his house at Bindjei in the plains in July.

717. HALPE HOMOLEA, Hewitson.

Originally described from Singapore. Occurs in Sumatra somewhat rarely on the outer hills from May to August.

718. HALPE ZEMA, Hewitson.

Grose Smith. The "*Hesperia*" *ormenes*, Weymer, Stet. Ent. Zeit., vol. xlviii, p. 16, n. 14, pl. ii, fig. 6, *male* (1887), from Nias, is a synonym of this species. Also rare, occurs from Selesseh to Bekantschan in March, July and November.

719. HALPE INSIGNIS, Distant.

Originally described from Singapore. It is a true *Halpe*, Mr. Distant placed it in the genus *Baoris* with a query. Excessively rare, Dr. Martin took a single male in August near Tandjong Djatti.

720. HALPE HIERON, de Nicéville.

H. hieron, de Nicéville, Journ. A. S. B., vol. lxiii, pt. 2, p. 54, n. 45, pl. iv, fig. 1, *male* (1894).

Hitherto only recorded from N.-E. Sumatra, where it occurs only at high elevations not below 3,000 feet to the south of Bekantschan. In suitable localities it is not rare, we have specimens taken in February, April and August.

721. *HALPE BETURIA, Hewitson.

Snellen. Captain Watson states that *H. beturia* is confined to Celebes, and he described the Indian, Burmese, and Andamanese form as *H. moorei*. It is probable that the Sumatran species should be known by the latter name. We did not obtain it.

722. *HALPE MARSENA, Hewitson.

Hewitson. Grose Smith. Kirby. Originally described from Sumatra. It is very close to, if not identical with, "*Hesperia*" *ornata*, Felder, described from Java, but occurring also in Cachar, *vide* Wood-Mason and de Nicéville, Journ. A. S. B., vol. lv, pt. ii, p. 382, n. 214, pl. xviii, figs. 7, 7*a*, *male* (1886). Hewitson's name has priority by one year.

723. ITON SEMAMORA, Moore.

I. semamora, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. ix, p. 401, n. i (1895).

Hesperia barea, Hewitson, Trans. Ent. Soc. Lond., third series, vol. ii, p. 490, n. 12 (1866).

Hewitson. Kirby. Hewitson described this species from Sumatra under the name of "*Hesperia*" *barea*. It occurs from Namoe Ockor to Bekantschan and in the Battak mountains in March, July and August.

724. BAORIS OCEIA, Hewitson.

Very rare, only a few male specimens taken near Bekantschan in March.

725. BAORIS (*Chapra*) MATHIAS, Fabricius.

Snellen as *julianus*, Fabricius [sic], and *julianus*, Latrielle. Hagen as *mathias* and *julianus*. Butler as *julianus*. The "*Hesperia*" *julianus* of Latreille was described from Java, and appears to be a synonym of "*Hesperia*" *mathias*, Fabricius. This widely-distributed butterfly is very common throughout the year in the plains of Sumatra, especially so near Mabar.

726. BAORIS (*Chapra*) BRUNNEA, Snellen.

Chapra cære, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. vi, p. 388, n. 31, pl. G, fig. 33, *male* (1891).

When describing this species from Burma, I overlooked Heer P. C. T. Snellen's description and figure of the species from Java. In Sumatra it is rare from Bindjei to Bekantschan in March, and again in October and November.

727. BAORIS (*Parnara*) CONJUNCTA, Herrich-Schäffer.

Hagen. This is the "*Hesperia*" *narooa* of Moore, the "*Gegenes*" *javana* of Mabille, and the "*Hesperia*" *alice* of Plötz, the latter described from Mergui and the Philippines, of which Herr Gustav Weymer has been so good as to send me a beautiful coloured drawing of the type, which is a male, now in the Berlin Museum. It occurs commonly over the whole of our area and throughout the year.

728. BAORIS (*Parnara*) TOONA, Moore.

I am unable to follow Mr. J. H. Leech in placing this species as a synonym of "*Pamphila*" *pellucida*, Murray, specimens of the latter species in my collection from Japan, from whence it was described, appear to me to be quite distinct from "*Hesperia*" *toona*. The upperside of both wings in fresh specimens of *B. toona* is rich ochreous, which it never is in *B. guttatus*, Bremer and Grey = "*Pamphila*" *mangala* Moore. *B. toona* has been figured and described by Mr. Distant in Rhop. Malay., p. 380, n. 3, pl. xxxiv, fig. 9 (1886) as *Baoris chaya*, Moore, a species which belongs to the *Chapra* section of the genus. Hitherto unrecorded localities for the species are Trevandrum in South India, Java, and Celebes. In N.-E. Sumatra it is as ubiquitous as the last-named species.

729. BAORIS (*Parnara*) CAHIRA, Moore.

Originally described from the South Andaman Isles. It has two spots in the discoidal cell and four on the disc of the forewing. I have specimens from Sumatra which agree with Mr. Moore's figure and description of the species. I have specimens also from Sumatra which agree with Mr. Moore's description and Mr. Elwes' woodcut of *Baoris austeni*, described from Assam, which also has two spots in the discoidal cell and five on the disc of the forewing. Again, I have other specimens from Sumatra agreeing with Mr. Moore's description of "*Hesperia*" *moolata*, described from Upper Tenasserim in Burma, which has one spot in the discoidal cell and also five on the disc of the forewing. Lastly, I have specimens from Sumatra agreeing with Mr. Moore's figure and description of "*Hesperia*" *kumara*, originally described from Canara in South India, recorded also from Mergui in Lower Burma and Ceylon by the author. It has no spots in the discoidal cell, but there are seven discal spots on the forewing. As all my Sumatran specimens appear to me to represent one and the same species, I record them under the oldest of Mr. Moore's four names. It may, however, be subsequently found on an examination of the prehensores of the male that some of these species may be valid. In Sumatra *B. cahira* is found at Bindjei and Namoe Oekor in the plains, but is much rarer than the two foregoing species, but flies throughout the year.

730. BAORIS (*Parnara*) BADA, Moore.

Pamphila apostata, Snellen, Midden-Sumatra, Lep., p. 27, n. 1 (1892).

"*Hesperia*" *bada*, Moore, was originally described from Ceylon and Malacca, and is figured in "The Lepidoptera of Ceylon" by the author. It has typically no spots in the discoidal cell of the forewing. Mr. Elwes says that "*Pamphila*" [sic] *mangala*, Moore, and "*Hesperia*" *bada*, Moore, as well as "*Pamphila*" [sic] *fortunei*, Felder, originally described from Shanghai in China, are synonyms of "*Eudamus*" *guttatus*, Bremer and Grey, originally described from North China. In this I do not entirely agree with him, as I consider *H. bada* and *H. fortunei* to be distinct. Mr. Leech gives *H. fortunei* as a synonym of *E. guttatus*, and omits *P. mangala* and *H. bada*. I agree with him in so far as to consider *P. mangala* to be synonymous with *E. guttatus*; the latter is, however, larger than (1·5 inches as against ♂, 1·2; ♀, 1·3 inches), and has a different facies to, *H. bada*. Leech says that *Parnara guttata* "Can be easily distinguished from *P. pellucida*, [Murray, originally described from Japan] by its longer, narrower wings, and by the spots of the hindwing, which are almost in a straight line, while in *P. pellucida* the arrangement is alternate." I have specimens of *P. pellucida* from Western China identified by Mr. Leech, and which agree with Mr. H. Pryer's figure of the species in "Rhopalocera Nihonica," pl. x, n. 11, *female*, also with Dr. O. Staudinger's figure in Romanoff's "Mémoires sur les Lépidoptères," vol. iii, pl. viii, fig. 3, *male*, which further differ from *E. guttatus* in the forewing in the lowest of the three subapical spots being moved outwards towards the margin instead of being directly under the other two; the spots in the discoidal cell are larger and not placed immediately above one another but obliquely; and, lastly, the antennæ are absolutely different, the shaft being half as long again as in *E. guttatus*, and the club elongated instead of being short and compressed. The differences in markings may perhaps be considered to be trivial unless shewn to be constant in a long series, but the difference in the antennæ must be specific. But Leech gives "*Hesperia*" *toona*, Moore, as a synonym of *P. pellucida*, which is, I think, incorrect. Watson gives *H. bada* as a distinct species, and places *P. mangala* as a synonym of *P. guttatus*. In this I agree with him. *H. fortunei* is probably distinct, though placed by Leech as a synonym of *E. guttatus*, as noted above. As figured in "Reise Novara," Lepidoptera, pl. lxxii, fig. 11, *male*, it has the antennæ as long as *P. pellucida*, but differs from that species in having no spots in the discoidal cell of the forewing, and the discal spots of the hindwing arranged in a straight line instead of being placed alternately. I would arrange all these names thus:—

1. *Baoris* (*Parnara*) *toona*, Moore, from the Himalayas, Bhutan, Assam, Burma, the Malay Peninsula, South India, Sumatra, Java, and Celebes.

2. *Baoris* (*Parnara*) *fortunei*, Felder, from Shanghai.

3. *Baoris* (*Parnara*) *pellucida*, Murray, from Japan and Western China.

4. *Baoris* (*Parnara*) *guttatus*, Bremer and Grey.

Pamphila mangala, Moore, from the Western Himalayas, China, and Japan.

5. *Baoris* (*Parnara*) *bada*, Moore.

Pamphila apostata, Snellen, from nearly the whole of India, Ceylon, Burma, Sumatra, and Java.

In *B. toona* there are always two spots in the discoidal cell of the forewing, usually conjoined. In *B. guttatus*, of which I have a good series from the Western Himalayas, Western and Central China, and Japan, there is sometimes a minute spot in the cell (probably this spot is occasionally absent altogether), or two spots, variable in size, but never conjoined. In *B. bada*, there are sometimes no spots, one, or two spots, never conjoined. This is the smallest and darkest-coloured species of the three. In Sumatra it is somewhat rarer than *B. cahira*, Moore, but occurs throughout the year from Bindjei to the outer hills.

731. BAORIS (*Parnara*) COLACA, Moore.

Originally described from the South Andaman Isles, and figured by Moore and Elwes. It differs from *B. bada*, Moore, in being smaller, with smaller spots on the hindwing, which are also slightly differently arranged. Occurs rarely on the outer hills in November.

732. BAORIS (*Parnara*) PUGNANS, de Nicéville.

Parnara pugnans, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. vi, p. 384, n. 28, pl. G, fig. 30, *female* (1891).

Originally described from the Malay Peninsula and Nias Island; in Sumatra it occurs at Selesseh, Namoe Oekor, and in the Battak mountains from July to October. It is found also in the island of Pulo Laut.

733. *BAORIS (*Parnara*) CINNARA, Wallace.

Grose Smith. Originally described from Formosa. The description is quite inadequate, and from it the species cannot be identified with certainty.

734. ISMENE ŒDIPODEA, Swainson.

Rare at high elevations south of Bekantschan in June and September.

735. ISMENE ETELKA, Hewitson.

Originally described from Sarawak in Borneo; occurs also in the Ataran Valley, Tenasserim, Burma. The species was described from a female, and is named *Ismene itelka* on the plate. In Sumatra it is very rare at higher elevations near Bekantschan. Three specimens only obtained, one each in March, July, and August.

736. ISMENE HARISA, Moore.

Somewhat rare throughout the year at high elevations from Bekantschan to the Central Plateau. This species was very common, however, in February, 1895, in Indragiri in the plains.

737. *ISMENE STRIATA, Hewitson.

Snellen. Originally described from China.

738. ISMENE RADIOSA, Plötz.

I. radiosa, Plötz, Berl. Ent. Zeitsch., vol. xxix, p. 232, n. 35 (1885); idem, id., Stet. Ent. Zeitsch., vol. xlvii, p. 114, n. 2*b* (1886).

Originally described from Celebes. My identification is based on specimens of this species sent to me so named by Heer M. C. Piepers from Java. A unique example has been obtained in Sumatra near Bekantschan in March.

739. ISMENE sp.

Dr. Martin informs me that his brother obtained three male specimens in Indragiri of an *Ismene* allied to *I. iluska*, Hewitson, *I. mahintha*, Moore, *I. antigone*, Röber, and *I. ionis*, de Nicéville. As I have not seen a specimen from Sumatra I cannot determine the species.

740. HASORA BADRA, Moore.

Hagen. Grose Smith. Common in the plains, most plentiful in April.

741. HASORA HADRIA, de Nicéville.

H. hadria, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. iv, p. 172, n. 10 (1889).

Common in the outer hills and near Selesseh in April, May, September and December.

742. HASORA CHABRONA, Plötz.

H. chabrona, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. ix, p. 406, n. 51 (1895).

Rarer than the two foregoing species, occurs near Selesseh and on the outer hills in April and September.

743. HASORA MYRA, Hewitson.

Originally described from Java. Occurs in Sumatra throughout the year at high elevations not below 3,000 feet, but never commonly.

744. HASORA (*Parata*) CHROMUS, Cramer.

Common on the outer hills in May and June.

745. HASORA (*Parata*) SIMPLICISSIMA, Mabille.

H. (Parata) simplicissima, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. ix, p. 405, n. 50, pl. Q, figs. 62, *male*; 63, *female* (1895).

Occurs not rarely throughout the year at low elevations, in the plains near Selesseh and at Tandjong Djatti.

746. *HASORA (*Parata*) MALAYANA, Felder.

Snellen. Originally described from the Malay Peninsula.

747. HASORA (*Parata*) CELÆNUS, Cramer.

Originally described from Amboina. Rare, found from Selesseh to Bekantschan in January and March.

748. HASORA (*Parata*) CHUZA, Hewitson.

Hagen. Originally described from Sarawak in Borneo. In N.-E. Sumatra it occurs at Selesseh, and on the Battak mountains from Bekantschan to the Central Plateau fairly commonly throughout the year.

749. BIBASIS SENA, Moore.

Flies throughout the year near Selesseh and on the outer hills, most plentiful in April.

750. BADAMIA EXCLAMATIONIS, Fabricius.

Throughout the year in the plains at Selesseh, and on the outer hills near Paya Bakong. The males come to wet spots on roads, where they settle with widely spread wings Dr. Martin notes. Mr. G. C. Dudgeon has recently described the transformations of this species from Bhutan in N.-E. India, in the Journal of the Bombay Natural History Society, vol. x, p. 144 (1895).

751. RHOPALOCAMPTA CRAWFURDI, Distant.

Hagen as *benjamini*. Occurs throughout the year at Selesseh and on the outer hills from Namoe Oekor to Bekantschan and south of that place. Herr O. Puttfarcken once found a larva of this species, and described it as follows :—"Has the typical shape of the larvæ of the *Hesperiidæ*, and is like that of *Erionota thrax*, Linnæus. It lived in a rolled-up leaf, is dark velvety blue with white transverse lines, head and legs yellow, head with three black spots arranged in a triangle."

The following species have been recorded from Sumatra by various authors, but we have not been able to identify them.

752. *TAGIADES SATAMPA.

Hagen. He does not give the name of the describer of this species as he usually does. We are unable to trace it. It is possible that he means the well-known hesperid genus *Satarupa*, Moore, which occurs in Sumatra, and is not mentioned by him, though he records *Satarupa sambara*, Moore, from Sumatra, under the name of *Tagiades sambara.*

753. *ISOTEINON PERTINAX.

Grose Smith. There is a "*Papilio*" *pertinax*, Stoll, described from Surinam in South America, which is placed by Kirby as a synonym of *Telegonus pervivax*, Hübner. From the figure I cannot find that it resembles any oriental hesperid. There is also a "*Papilio*" *pertinax*, Sepp, from Surinam, which has been re-named *Pamphila schelleri* by Kirby. The book in which it is described and figured is not available to me. Furthermore, there is a "*Papilio*" *pertinax* of Cramer, described from Surinam, which name stands. This species is the type of the genus *Phlebodes*, Hübner.

754. *ISOTEINON MERJA.

Grose Smith. I am unable to trace this species, and Mr. Grose Smith does not say by whom it was described.

755. *PAMPHILA FETTINGI, Möschler.

P. fettingi, Möschler, Verh. zool.-bot. Gesellsch. Wien, vol. xxviii, p. 219, n. 26 (1879).

Originally described from males from Sumatra. From the description it appears to be closely allied to *Padraona pavor*, de Nicéville (*vide* No. 713 *ante*).

756. *HESPERIA TRAVIATA, Plötz.

H. traviata, Plötz, Stet. Ent. Zeit., vol. xlvii, p. 91, n. 75c (1886).

Originally described from Sumatra. It is compared with *Lotongus parthenope*, Weymer, and from the description probably belongs to that genus (*vide* No. 689 *ante*).